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3. In Memoriam, Charles Dean Bunker, 1870-1948. By E. Raymond Hall. Pp. 1-11, 1 figure in text. December 15, 1951.

4. The University of Kansas, Natural History Reservation. By Henry S. Fitch. Pp. 1-38, 4 plates, 3 figures in text. February 20, 1952.

5. Prairie Chickens of Kansas. By Maurice F. Baker. Pp. 1-68, 4 plates, 15 figures in text. March 10, 1953.

6. The Barren Ground Caribou of Keewatin. By Francis Harper. Pp. 1-140, 28 figs. October 21, 1955. Copies, paper bound, $1.50 postpaid from The Arctic Institute of North America, 1530 P Street NW, Washington, D.C.

7. Handbook of Mammals of Kansas. By E. Raymond Hall. Pp. 1-303, illustrated. December 13, 1955. Paper bound, $1.50 postpaid (cloth $4.00).

8. Mammals of Northern Alaska, *on the Arctic Slope*. By James W. Bee and E. Raymond Hall. Pp. 1-309, Frontispiece colored, 4 plates, 127 figures in text. March 10, 1956. Paper bound, $1.00 postpaid (cloth $4.00).

9. Handbook of Amphibians and Reptiles of Kansas. By Hobart M. Smith. 2nd [revised] edition. Pp. 1-356, 253 figures. April 20, 1956. Paper bound, $1.50 postpaid (cloth $4.00).

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The MAMMALS of Keewatin

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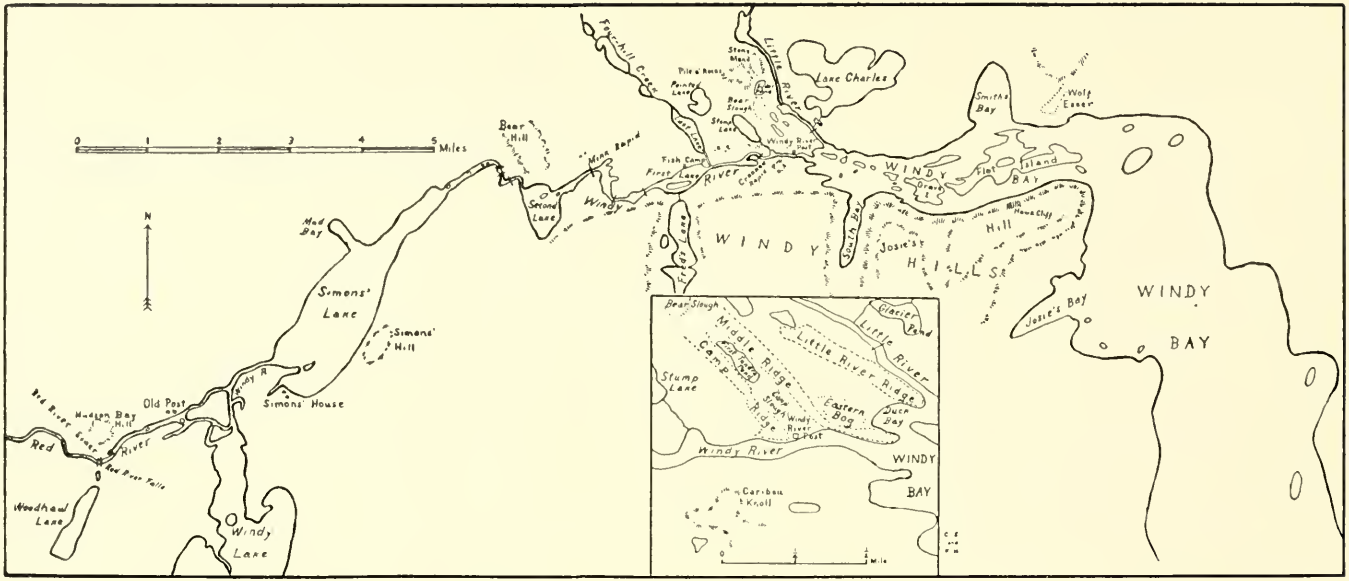

Map 1.—The Windy River area at the northwestern extremity of Nueltin Lake, southwestern Keewatin. (Most of the smaller features bear merely local or unofficial names.)

COVER: A Keewatin Tundra Wolf watching the approach of Barren Ground Caribou
Drawing by Earl L. Poole

THE MAMMALS OF KEEWATIN

THE MAMMALS OF KEEWATIN

BY
FRANCIS HARPER

UNIVERSITY OF KANSAS
LAWRENCE · KANSAS

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University of Kansas
Museum of Natural History

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Introduction

Until recent years we have had little knowledge of the detailed distribution of mammalian life in the vast, lonely lands lying between the lower Thelon River and Chesterfield Inlet on the north, Hudson Bay on the east, Reindeer Lake on the south, and Athabaska, Great Slave, and Artillery lakes on the west. In fact, that condition still prevails over the greater part of the territory just outlined. In the present century, however, significant additions to our knowledge of mammals have been made about the periphery of this territory: for example, by Preble (1902; 1908) on the western shore of Hudson Bay and in the Athabaska-Mackenzie region; by Preble and Seton (1911) in the Fort Reliance and Artillery Lake area and northward; by Buchanan (1920) about Reindeer Lake; and by Clarke (1940) in the Thelon Game Sanctuary. Finally Manning (1948) pushed into the hinterland of Hudson Bay by plane and briefly investigated a considerable number of localities between Reindeer Lake and Baker Lake.

A long-standing ambition of my own to investigate the fauna and flora of the Nueltin Lake region in southwestern Keewatin became attainable in 1947 through support of the Arctic Institute of North America (under contractual arrangements with the Office of Naval Research). I reached Nueltin Lake by plane from Churchill on May 31 and returned to the latter point on December 4. Most of the intervening six months was spent in intensive studies within two miles of the mouth of Windy River at the northwestern extremity of the lake (map 1). Brief excursions took me a little farther afield: to Josie's Bay (pl. 1, fig. 2), about four miles to the southeast, July 10 to 20; and to Simons' Lake and vicinity, 10-12 miles to the west-southwest, October 13 to 22. In addition, on July 31 there was a nonstop plane flight from Windy River to the upper Kazan River region and return. I have included in the present report a few notes obtained along the Hudson Bay Railway between The Pas and Churchill, May 20 and 21, and at Churchill, May 21 to 31.

This paper is the eleventh one in a series that has been published on the biological results of the Nueltin Lake Expedition, Keewatin, 1947. Six of these have been prepared by collaborating specialists, and the others by myself. Several additional reports are under way or in prospect.

Physiography and vegetation

I have discussed these subjects briefly in a recent paper (1953:4-6) and I plan a more extensive later presentation. Consequently, a few

words will suffice here. The local proportion of land to water (lakes, streams, and tundra ponds) is estimated at about 3 to 1; and the proportion of Barren Grounds to forested tracts at 4 (or more) to 1. Altitudes vary from about 875 feet at the surface of Nueltin Lake to 1400 feet at the summit of the Windy Hills (see map 1). Most of the hills and ridges have moderate contours (pls. 1, 2, 4, 6); but here and there are cliffs and talus slopes. Numerous lichen-covered boulders, up to a rod or more in diameter, rest on the surface; there are also considerable exposures of bedrock.

The principal trees are black spruce and tamarack; comparatively few of these attain a height of more than 30 feet. There are also a few white spruces, canoe birches, and balsam poplars. Higher shrubs include willows, dwarf birch, and alder; some of the commoner lower shrubs are *Vaccinium uliginosum, V. vitis-idaea* var. *minus, Empetrum nigrum, Ledum groenlandicum, L. decumbens, Kalmia polifolia, Andromeda polifolia, Rhododendron lapponicum, Arctostaphylos alpina,* and *Loiseleuria procumbens.*

Reports on the plant materials collected in this region have been published as follows: mosses, by Edwin B. Bartram (1950); lichens and hepatics, by W. L. Dix (1951); and vascular plants, by A. E. Porsild (1950).

In the following pages various plants are mentioned, sometimes by their technical names and sometimes by their common names. To facilitate their more complete identification, by either professional botanists or laymen, the following list is supplied, including both technical and common names:

Mosses	
Sphagnum spp.	Sphagnum moss
Lichens	
Cladonia spp.	Caribou lichen or "moss"
Vascular Plants	
Equisetum sylvaticum	Wood horsetail
Picea glauca	White spruce
Picea mariana	Black spruce
Larix laricina	Tamarack
Potamogeton friesii	A pondweed
Calamagrostis canadensis	Blue-joint grass
Poa alpigena	Meadow-grass
Eriophorum sp.	Cotton-grass
Carex aquatilis	A sedge
Populus balsamifera	Balsam poplar
Salix planifolia and other species	Willow

Betula glandulosa	Dwarf birch
Betula papyrifera var. *neoalaskana*	Canoe birch
Alnus crispa	Green alder
Rubus chamaemorus	Baked-apple berry
Potentilla palustris	Marsh cinquefoil
Empetrum nigrum	Crowberry
Ledum decumbens	Narrow-leaved Labrador tea
Ledum groenlandicum	Common Labrador tea
Rhododendron lapponicum	Lapland rosebay
Loiseleuria procumbens	Alpine azalea
Kalmia polifolia	Bog laurel
Andromeda polifolia	Bog rosemary
Chamaedaphne calyculata	Leather-leaf
Arctostaphylos alpina	Alpine bearberry
Vaccinium uliginosum	Bog bilberry
Vaccinium vitis-ideaea var. *minus*	Mountain cranberry
Petasites sagittatus	Sweet coltsfoot

Comparative abundance of species

In any consideration of this subject, it is obvious that the predominantly herbivorous rodents and their allies in a given region must be far more numerous than the carnivores that live largely upon them. Furthermore, the factors that influence records and estimates of numbers—such as size or visibility of the species, diurnal or nocturnal habits, solitariness or gregariousness, secretiveness or unwariness, ease or difficulty of trapping or hunting—vary much with different groups of mammals. In this brief consideration of the local species, therefore, I shall treat the Insectivora, Lagomorpha, and Rodentia in one category and the Carnivora in another, while omitting the Pinnipedia (Freshwater Seal) and the Artiodactyla (Moose and Caribou) altogether. The following estimates of comparative abundance are based in part on the number of specimens secured, in part on the number of observations of the animals themselves and their tracks or other signs, and in part on the reports furnished by the local residents. The species are listed in the order of estimated abundance. The number of specimens secured and prepared in 1947 follows the name of each species.

Insectivora, Lagomorpha, and Rodentia

Clethrionomys gapperi athabascae, 41
Microtus pennsylvanicus drummondii, 18
Phenacomys ungava mackenzii, 18
Sorex cinereus cinereus, 9
Tamiasciurus hudsonicus preblei, 11
Dicrostonyx groenlandicus richardsoni, 4
Lepus arcticus andersoni, 0
Ondatra zibethicus albus, 1

Castor canadensis canadensis, 0
Lepus americanus americanus, 0
Erethizon dorsatum dorsatum, 0

CARNIVORA

Alopex lagopus innuitus, 0
Mustela erminea richardsonii, 1
Vulpes fulva ?regalis, 0
Canis lupus hudsonicus, 2
Mustela vison lacustris, 1
Gulo luscus luscus, 0
Euarctos americanus americanus, 1
Lutra canadensis preblei, 0
Martes americana abieticola, 0

Summation of distributional records

At the close of the account of each species I have added, from the previous literature, records of its known distribution in adjacent regions —particularly southern Keewatin, eastern Mackenzie, and the northern parts of Manitoba, Saskatchewan, and Alberta. For some of the species there has been apparently no such comprehensive summation since the outstanding works of Preble (1902; 1908). To conserve time and space I have not usually cited the works published prior to those of Preble, but have simply utilized his summaries. Particular attention has been paid to records from the mixed forest and tundra areas along the wide boundary between the Hudsonian Life-zone and the Arctic Life-zone, stretching from Churchill some 900 miles northwest to Great Bear Lake. The aim has been to bring up to date, in one place, our knowledge of the general and zonal distribution, in this part of Canada, of the mammals discussed.

Classification and nomenclature

The sequence of families, genera, and species, and the nomenclature as well, are in general accord with Miller and Kellogg's *List of North American Recent Mammals* (1955).

Color terms

In the descriptions of pelages, these terms, when derived from Ridgway (1912), are capitalized.

Measurements

Measurements of total length, and of the tail, are taken to the end of the vertebrae, not of the hair in the terminal tuft; that of the hind foot, to the end of the longest claw; and that of the ear, from the crown (not the notch) to the extremity of the fleshy rim (not including the hair).

Acknowledgements

The Arctic Institute of North America, which has given such a decided impetus to Arctic and Sub-arctic research during the few years since its founding, enabled me to undertake the investigations on the mammals and the other biota of the Nueltin Lake region. Its aid was extended by means of a grant from funds supplied to it by the Office of Naval Research. A more recent grant from the National Science Foundation has enabled me to bring to completion several of the longer papers resulting from the expedition of 1947. Further support has been provided by the Reading Public Museum and Art Gallery, through its director, Dr. Earl L. Poole. It is a pleasure to acknowledge my indebtedness and gratitude to these several organizations. The greater part of my Keewatin mammal collection of about 126 specimens has been divided between the United States National Museum and the Reading Public Museum and Art Gallery.

It is altogether fitting that I should mention various courtesies received from the Administration of the Northwest Territories (through Mr. R. A. Gibson, at that time deputy commissioner); the Royal Canadian Mounted Police (through Superintendent D. J. Martin, "G" Division); the Commissioner of Customs, Department of National Revenue; the Manitoba Department of Mines and Natural Resources (through Mr. G. W. Malaher, director of the Game and Fisheries Branch, and Mr. H. E. Wells, inspector); and Dr. Robert F. Yule, of the Department of National Health and Welfare.

The reader of the following pages will realize how much of the information here presented is due to the keen observational powers of Charles Schweder (pl. 4, fig. 2) and his brother, Fred Schweder, Jr., (pl. 6, fig. 1). The intimate knowledge of the local mammals that they had gained during their youthful years in the Nueltin Lake region was most freely and generously placed at my disposal. Without their contributions this report would be deprived of much of whatever savor it may have. The hospitality they provided during my six-months sojourn at their Windy River post (pl. 1, fig. 1) was of a rare kind. The three children of the post—10-year-old Mike Schweder and two Eskimos, 15-year-old Anoteelik and 5-year-old Rita—also helped in various ways, including the collection and preparation of specimens.

A number of other persons, whose names appear here and there, contributed notes of value. Among them I must mention particularly Mr. W. E. Brown, of the Hudson's Bay Company (see the account of *Phoca vitulina*), and Mr. John Ingebrigtsen, of Churchill (see the accounts of *Delphinapterus* and *Thalarctos*).

Mr. William C. Morrow, of Swarthmore, Pennsylvania, generously loaned me a motion-picture camera, with which an unusual pictorial record of the Barren Ground Caribou and other animals was secured.

Dr. Charles O. Handley, Jr., of the United States National Museum, has helped materially in the determination of some of the smaller mammals, particularly *Tamiasciurus* and *Clethrionomys*.

Several staff members and collaborators of the Entomology Research Branch, United States Department of Agriculture, kindly undertook the laborious determination of the mammalian ectoparasites brought back from Keewatin. Their names and the groups in which they specialize are mentioned in the appendix on mammalian ectoparasites.

Accounts of Species

Sorex cinereus cinereus Kerr.

Common Masked Shrew

Nine specimens of this shrew (fig. 1) were trapped near the mouth of Windy River, one on June 19 and the remainder between September 2 and October 24. Seven of these were taken in more or less open sedge bogs, which seem to constitute the principal local habitat of the species; one came from a spruce and tamarack muskeg, and one from a dwarf birch thicket. Some of the principal elements in the vegetation within a few yards of the places of capture were the following (listed in the approximate order of abundance): sphagnum, sedge (spp.), black spruce, willow, *Ledum groenlandicum,* dwarf birch, *Ledum decumbens, Rubus chamaemorus, Chamaedaphne, Potentilla palustris, Vaccinium uliginosum,* tamarack, *Cladonia,* mountain cranberry, *Equisetum sylvaticum,* and *Petasites sagittatus.*

a *b*

Fig. 1.—Common Masked Shrew, male (orig. no. 1084): (*a*) profile (×1); (*b*) sole of left hind foot (×1). Windy River, September 2, 1947.

Two of the specimens were taken between 9 a.m. and 3 p.m. Fred Schweder, Jr., reported seeing the species in the cabin on Windy River by day as well as by night; here it consumes meat left on the floor. Charles Schweder spoke of finding an individual drowned in a water bucket on the Kazan River 15 miles below Ennadai Lake. Most of my specimens were taken with pecan meat as bait; one, with caribou fat.

In the fall I noticed various ridged tunnels extending just beneath the surface of fresh snow, like miniature runways of the Common Mole (*Scalopus*) in the soil. These may have been the work of *Sorex* (*cf.* Nelson, in Nelson and True, 1887:271).

Two of the specimens yielded a few tiny white mites (*Listrophorus*

sp., September 3; *Listrophoridae,* hypopial stage, October 24); but no ectoparasites were found on the others.

An adult female of June 19 contained about six 8-mm. embryos. Its lateral glands were not evidently developed, and its odor was mild. Only two pairs of mammae (both inguinal) were evident, although normally there is a third, abdominal pair. In four other females (September 3 to October 24) the uterus was small and there were no embryos; lateral glands were not evident, and there was little odor. In three males (September 2 to October 2) there was little or no evidence of lateral glands; the testes varied from 1.5×1 to .75×.60 mm. Probably all of the September and October specimens (maximum length 97 mm., maximum weight 4.3 g.) are immature (*cf.* Pruitt, 1954).

The hide was prime in males of September 27 and October 2, and in females of September 30 and October 24. Unprime areas were noted as follows: September 2, whole dorsum; September 3, dorsum from nape to rump; September 27 and October 3, entire hide.

The present series of specimens shows no approach in color characters to *S. c. ugyunak* Anderson and Rand (1945*b*), which ranges from northern Alaska to south-central Keewatin. The point nearest to Nueltin Lake from which the latter is recorded (45 miles southwest of Padlei) is about 75 miles northeast of the Windy River. The present series shows no seasonal change of coloration of any appreciable extent. The dorsum and sides of body are near Bister, changing gradually into Pale Olive-Buff or Pale Gull Gray (with a silvery cast) on the under parts; tail bicolor, Clove Brown above, Light Brownish Olive below (darker toward tip).

The average measurements of two males and of three nonpregnant females were: length, 92.5, 94.7; tail, 38, 40; foot, 11.75, 12.3; ear, 5.5, 6.2 mm.; weight, 2.9, 3.4 grams.

Three Chipewyans from the south end of Nueltin Lake appeared familiar with this species. After inspecting my specimens, they gave a name for them sounding like *Dak.*

This subspecies has been recorded from various localities between Norway House and York Factory, Manitoba (Preble, 1902:72; Jackson, 1928:47). Anderson (1947:14) includes in the range of *cinereus* "northern Manitoba, northern Saskatchewan, . . . and Northwest Territories to northern limit of trees." Among numerous records from the Athabaska-Mackenzie region, Preble (1908:242) seems to have none from localities east of the valleys of the Athabaska and Slave rivers. Jackson (1928:47,49) lists specimens from Lake Athabaska as follows: Cypress Point and 10 miles east-northeast of Sand Point, Alberta, Fair

Point, Poplar Point, 8 miles northeast of Moose Island, and mouth of Beaver River, Saskatchewan.

Lepus arcticus andersoni Nelson
ANDERSON'S ARCTIC HARE

The most striking bit of information I obtained concerning this species is its migratory habit. There is a marked dearth of literature on this phase of its life history, aside from a couple of remarks quoted below (*cf.* Dowling, 1893:108; Preble, 1902:56 and 1908:208).

During the winter, as I learned from the Schweder brothers, Arctic Hares appear in fair numbers in the Windy River area. In early June and throughout the summer I found their old droppings to be numerous on the hilly Barrens, and especially about low patches of dwarf birch and willow. The tender tips of the dwarf birch twigs must be a favorite food. The animals are also said to feed regularly on the stomach contents of eviscerated Caribou. They show a predilection for rocky places; thus the rock-studded Windy Hills, extending along the south side of Windy River, constitute a favorite haunt. Here an accumulation of pellets beneath the overhanging edge of a boulder indicated the sort of resting-place they seek. They seem to avoid the tops of ridges, where winter winds sweep the snow away and where white animals would be conspicuous on the bare ground.

In winter they appear to feed mainly by night. Then they come into the dooryard of the Windy River post, visit the pile of kitchen refuse and ashes, and go among the tethered dogs. When Charles Schweder sees one in the daytime, it is generally sitting quietly. Twice he has passed so close to one with his dogteam that the dogs have almost grabbed it. Ordinarily, however, the species is quite shy. The presence of Arctic Hares is generally determined by their tracks rather than by sight of the animals. Fred Schweder, Jr., has seen no more than two together. Up to 1947 he had shot only five individuals, but he gets a good many in traps. He does not usually eat them unless caribou meat is scarce. Charles Schweder sees a good many of the Hares in winter, and often hunts them, but without success. Those he has secured have been met with accidentally. He states that Arctic Hare stew tastes just like that of the Snowshoe Rabbit. He uses the captured animals for fox bait.

Fred Schweder, Jr., speaks of finding tracks indicating the pursuit of Arctic Hares by Wolves and Red Foxes (but not Arctic Foxes). However, he has never found evidence in the snow of one being actually caught. Charles Schweder reports that apparently both species of foxes

take the Hares out of traps. He states that Snowy Owls eat the animals, and he has seen a fairly small hawk in pursuit of one.

The bulk of the animals disappear during the summer, evidently by migration toward the north. Although the residents are not aware just when this migration takes place, it would presumably be completed not later than June, before the ice has gone from the rivers that lie across the migratory paths. In six years Fred Schweder, Jr., has noted only one Arctic Hare in summer in the Windy River area; he saw it a couple of times, approximately in the early part of June. On September 19, 1947, Fred saw a set of tracks in sand 10 miles north of the Windy River post; the animal presumably spent the summer thereabouts. In July, about 1943, Charles Schweder found an adult and two young some 40 miles northeast of Windy River. He walked within 5 feet of them, and an accompanying Eskimo hurled a stone at them. All were in the gray pelage, and the young were not much smaller than the adult. On another occasion, about the middle of October, Charles shot one about 15 miles southeast of the Kazan River, perhaps in the same general area as the observation of July; it was in the winter pelage.

In the Windy River area the Arctic Hares usually arrive from the north in November. It was therefore a matter of considerable surprise when Fred found a number of tracks in the snow on the south side of Windy River on October 6. That was weeks before the river froze over, and the animals must have spent the summer there. He found that one or more of them had been digging into a muskeg for something. Two days later I found the tracks extending from the river's edge up into the rocky Windy Hills as far as I went (say a quarter of a mile). During the following two months I noted no more tracks, although in the normal migration schedule the animals from the north should have arrived in November. On November 30, however, I found a fresh pellet on a wind-swept knoll on the south side of the river. It was roughly spheroidal, but considerably flattened—19×17×11 mm. On a five-day trip toward the south end of Nueltin Lake during the last week of November, Fred Schweder, Jr., found no tracks. In the following March Charles wrote me that very few of the Hares had been present that winter. It might be remarked that the same winter had been marked by an unusual scarcity of Arctic Foxes.

In a previous year Fred has found the sign of this species as far south as the Narrows of Nueltin Lake. On the other hand, Joe Highway reports none about the extreme south end of this lake or at Putahow Lake. In late May I found a few droppings in the rocky hills at Churchill. At the Windy River post there was a cased skin of a locally taken specimen.

The Eskimos of the upper Kazan River (pl. 6, fig. 2) are said to rarely eat Arctic Hares, though capturing them in their fox traps. They feed some to their dogs, but seem to make no use of the hide or fur. Rae observes (1888:144) that the Arctic Hare, before settling down for the day, makes a complication of tracks, whence it makes several long jumps to *leeward*, then usually crouches down close to some large stones. The purpose is obviously to baffle an enemy following its trail.

In the absence of specimens, it is impossible to say to what subspecies the Arctic Hares of the Nueltin Lake area should be assigned. They are only provisionally referred to *andersoni*. Anderson remarks (1947:97) concerning this subspecies: "No specimens are available from east of Bathurst Inlet and Beechey Lake on upper Back River in Mackenzie district, but [it] probably occurs farther east to meet the range of *L. a. labradorius* on west side of Hudson Bay." Farther west it ranges "from north side of Great Slave Lake (Fort Rae), Hanbury Lake, and Aylmer Lake, and to the Arctic coast and . . . Victoria Island . . . and Banks Island"; also west to "Reindeer Hills east of lower Mackenzie River delta." Anderson had earlier (1913:515) recorded the animal from various points along the Arctic coast. James MacKinlay (Dowling, 1893: 108; Preble, 1908:208) noted winter signs a short distance north of Great Slave Lake in the summer of 1890; "the animals had since gone northward." Preble (1902:56) speaks of the subspecies *canus* [=*labradorius*] as occurring "throughout the Barren Grounds from Fort Churchill northward"; "in winter they migrate to a slight extent, reaching the neighborhood of York Factory and perhaps farther." The same form is recorded from Southampton Island by Sutton and Hamilton (1932:71). Preble (1908:207-208) gives numerous records from the older literature; among the localities mentioned are Great Bear Lake, Coppermine River, and Thelon River. Preble and Seton (1911:347) have records from Artillery, Clinton-Colden, and Aylmer lakes; Blanchet (1925:34; 1927: 150), from the Lac de Gras region and from a southwestern tributary of Dubawnt River; Degerbol (1935:3), from Baker Lake and Montreal Island; Clarke (1940:38), from Plover, Artillery, Clinton-Colden, Sifton, and Aberdeen lakes; Manning (1943:104), from the west coast of Roe's Welcome; Gavin (1945:230), from the Perry River district and Bathurst Inlet; Manning (1948:26), from South Henik Lake, Keewatin; and Gunderson, Breckenridge, and Jarosz (1955:258), from the lower Back River. A. H. Howell (1936:322, 327, fig. 1) summarizes previous records of both *labradorius* and *andersoni*. Both Howell and Hall (1951*a*:178, fig. 45) leave southwestern Keewatin blank on their distributional maps of the subspecies of *Lepus arcticus*.

Lepus americanus americanus Erxleben
AMERICAN SNOWSHOE RABBIT

The Windy River area must be close to the limit of the extension of this species into the Barren Grounds, and its local population is evidently small. I made no observations of my own.

According to Charles Schweder, there have been a few of the animals every year in the spruce tracts about the river's mouth. In former years he found them common in the area about the "Old Post" on the Red River above Simons' Lake, where there is a considerable amount of "bush" country (spruce and tamarack growth). In this latter area some of the animals have been killed by Joe Highway as well as by Charles. Some years previously, in the spring, Charles found a dead individual about 40 miles northeast of Windy River. Snowshoe Rabbits are reported throughout the territory extending from the southern portion of Nueltin Lake to Reindeer Lake; they are much more numerous in some years than others.

The local name is "Bush Rabbit."

Hearne (1795:71) mentions "rabbits" (presumably of the present species) at Nueltin Lake. Preble (1902:59) reports the species "throughout the region between Lake Winnipeg and Hudson Bay"; particular localities mentioned are Oxford House, York Factory, and Churchill. He presents (1908:199) many records from the Athabaska-Mackenzie region, including the stretch of country between Fort Rae and Great Bear Lake, which is evidently occupied by the subspecies *macfarlani* (*cf.* Nelson, 1909:100). Preble and Seton (1911:347) found signs about the east end of Great Slave Lake. Hornby (1934:109) reports *macfarlani* north of Artillery Lake. In 1914 Buchanan (1920:215) found the territory about Reindeer and Brochet lakes "almost barren of this species." In the same year I found Snowshoe Rabbits varying from abundant along the middle course of the Athabaska River to scarce in the country south of Great Slave Lake; Tsalwor Lake and Tazin and Taltson rivers are among the localities mentioned (1932:29). Anderson (1913:514) reports the subspecies *macfarlani* north to the Arctic coast from the Mackenzie Delta to Franklin Bay. The same author (1947:100) includes southern Keewatin and southeastern Mackenzie in the range of *L. a. americanus*. Manning (1948:26) has records from Sandhill Lake, Manitoba, and Malaher Lake, Keewatin.

Marmota monax canadensis (Erxleben)
CANADIAN WOODCHUCK

At Amery, on the north side of the Nelson River, Manitoba, I noticed

on May 21 the hide of one of these animals beside some tethered sled dogs.

Preble (1902:47) and A. H. Howell (1915:32) record the Woodchuck north to Oxford House, Trout Lake, and York Factory, Manitoba. Buchanan (1920:215) reports it no farther north than Beaver River, Saskatchewan. In the Athabaska-Mackenzie region it ranges "north to Great Slave Lake and the mouth of the Liard" (Preble, 1908:159). Of the foregoing localities, only York Factory seems to lie within the zone of permafrost (cf. Thomas, 1953:chart 8-1).

Spermophilus undulatus parryii (Richardson)

PARRY'S GROUND SQUIRREL

In Keewatin this species seems to avoid the southernmost strip of the Barren Grounds bordering the forested zone. It seems to be absent, for example, in the country lying between Windy River and the upper Kazan River. At a point on the western side of the latter river, about a dozen miles below Ennadai Lake, Fred Schweder, Jr., saw three of the animals on some sand ridges on August, 1944. At another point some 30 miles west-northwest of the last-mentioned locality, about the middle of May, 1946, three specimens were trapped on a sand ridge; the skin of one was preserved and presented to me by Charles Schweder. The location was approximately in latitude 61° 35′ N., longitude 101° 31′ W. John Ingebrigtsen has not noticed these Ground Squirrels south of Dawson Inlet on Hudson Bay.

Preble (1902:46) records the species as far south as 25 miles below Eskimo Point. Later (1908:161) he gives many records for the Mackenzie region, including the following localities: Fort Enterprise, Artillery Lake, Back, Thelon, Anderson, Lockhart, and Dease rivers, and Great Bear Lake. Preble and Seton (1911:342) report the species from Artillery, Casba (=Ptarmigan), Clinton-Colden, and Aylmer lakes. Anderson (1913:511) mentions its occurrence at the mouth of the Coppermine River and on Coronation Gulf. Critchell-Bullock (1930:212) presents records from Thelon River and Artillery, Campbell, and Baker lakes; Sutton and Hamilton (1932:52), from Repulse Bay and Chesterfield Inlet; Hornby (1934:109), from Artillery Lake and the Thelon and Hanbury rivers; Degerbol (1935:16), from Wager Inlet, Chesterfield Inlet, Eskimo Point, and Yathkyed Lake; Freuchen (1935:93), from Rae Isthmus, Pelly Bay, and Repulse Bay; A. H. Howell (1938:91), from Eskimo Point (25 miles south), Cape Fullerton, Kasba (=Ptarmigan?) Lake, and Marble Island; Clarke (1940:37), from "all our stations in the barrens" and from Kazan River; Gavin (1945:229), from Perry River; and Manning (1948:25), from Tha-anne River and Alder, Carr, Victory, and Twin lakes, Keewatin. Banfield (1951:116) adds records from Contwoyto, Sussex, and Muskox lakes and Bathurst Inlet; and Gunderson, Breckenridge, and Jarosz (1955:227), from the lower Back River. Holland (1949:114) lists *Citellus* (=*Spermophilus*) as the host of a flea, *Oropsylla alaskensis* (Baker), in the Thelon Game Sanctuary and at Baker and Yathkyed lakes.

Eutamias minimus hudsonius Anderson and Rand
HUDSON BAY CHIPMUNK

Two of these chipmunks were seen on May 21 at Herchmer, Manitoba. This is the northernmost point from which Anderson and Rand (1944:133) and Anderson (1947:114) report this subspecies; their other localities are Bird, Thicket Portage, and Albert Lake near Flin Flon, Manitoba. Intergradation with *E. m. borealis* takes place in the vicinity of The Pas. The latter subspecies is known from many localities in the Athabaska-Mackenzie region (Preble, 1908:167; Preble and Seton, 1911:343; Harper, 1932:27); it ranges north at least as far as Fort Simpson.

The northern limit of *Eutamias minimus* apparently extends but little, if at all, beyond the southern limit of permafrost (*cf.* Thomas, 1953: chart 8-1).

Tamiasciurus hudsonicus preblei A. H. Howell
MACKENZIE RED SQUIRREL

Effect of habitat on behavior

During the summer the Red Squirrels (fig. 2) in the Windy River area seem to be strangely silent and secretive creatures, in marked contrast to the snickering and scolding individuals of the Athabaska region. Manning (1948:25) comments likewise on the non-vociferous behavior of the species in northern Manitoba and southern Keewatin. Here it seems to be almost more of a ground squirrel than a tree squirrel. The stunted spruce and tamarack trees offer it little security in the way of vantage-points from which to hurl defiance or derision at an intruder. Moreover, many of the spruces grow so sparsely, and their branches are so short, that the squirrel lacks good facilities for leaping from one tree to another. Consequently, for the most part it seems to go underground at the appearance of danger and to maintain silence there. In spruce tracts where snows of autumn revealed tracks of a considerable number of squirrels, few of the animals themselves were either seen or heard in the entire summer. In their behavior most of the individuals appeared the very antithesis of their confiding cousins of the Athabaska region.

At the falls on Red River, 3 miles southwest of Simons' Lake, some white spruces, up to 2 feet in diameter, grow on an esker. This is the finest, tallest, and perhaps the most extensive growth of white spruce I met with in the entire area where I spent the season. Here, on October 20, a couple of Red Squirrels attracted me by their scolding and rubber-doll squeaking. They perched on the limbs overhead and were not at

all shy. Their behavior was notably different from that of practically all the Red Squirrels in the thickets of stunted black spruce about the mouth of Windy River. They obviously felt secure on their high arboreal perches; there was no need to scuttle into some subterranean burrow at the approach of an intruder, and no need to inhibit their natural vociferousness. In other words, they behaved much like their relatives in the lofty spruces of the Athabaska region. The difference in the height and spread of the two spruces evidently accounts for a greater proclivity for an arboreal existence among the taller species. The ground here was littered with cone fragments to an extent scarcely observed about the

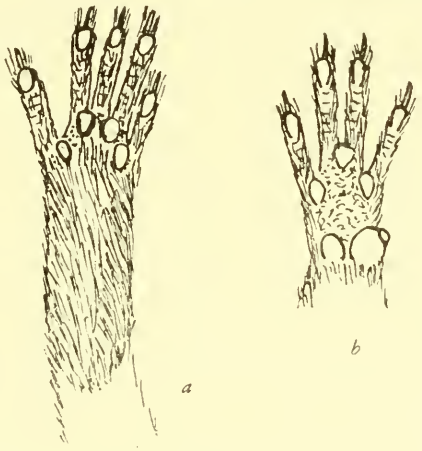

Fig. 2—Mackenzie Red Squirrel, subadult male (orig. no. 1093): (*a*) sole of right hind foot (×1); (*b*) sole of right forefoot (×1). Windy River, September 5, 1947.

mouth of Windy River. Possibly the cones of the white spruce furnish more agreeable food than those of the black spruce. It would have been interesting, if specimens had been obtained, to ascertain whether the Red Squirrels at Red River Falls possibly exhibit differences in morphology as well as in behavior from those inhabiting the black spruce areas.

Charles Schweder remarked on the greater vociferousness of the species about Reindeer Lake than in the Windy River area.

Nesting

For more than two months after my arrival on May 31, the only adult Red Squirrel that came to my attention was one that appeared at intervals on the log buildings of the camp. On the first couple of occasions, in early June, it dashed off across the snow toward a spruce thicket a hundred yards away, which seemed to be its proper haunt.

We had no inkling of the use it was making of our cabin until July 24, when a blind and naked baby squirrel (pl. 2, fig. 2) was found on the floor! It had fallen from a nest between the rafter poles and the roofing paper above. When I thrust my fingers between the poles there was a chirrup of alarm or protest from the adult. The baby's weight was 9.95 grams. The total length is roughly 80 mm.; tail, 23; foot, 11.5. The eyes and ears are closed; the umbilical cord is still present; and the claws are developed. Vibrissae are 3 mm. in length; there are a few other and shorter hairs on the chin and above and beneath the eyes. The date of birth must have been six or seven weeks later than Preble's record (1908:170) of a litter at Fort Simpson, Mackenzie.

It was not until August 4 that we undertook to investigate the nest, only to find it empty. The mother had evidently removed the other young ones in the meantime. There was a passage-way about 4 feet in length from the upper edge of the roof to the nest. The nest material was sphagnum moss (used for chinking the rafter poles) and caribou hair (probably derived from hides covering the outer wall of the cabin). When we climbed on the roof, the mother called from the neighboring spruce thicket, and soon appeared on the roof, where it allowed me to film it at close range. The worn spots in its pelage about the mammae were plainly visible. Probably the young ones had been shifted only a short distance to some other place on this or a neighboring roof. After that date, however, my notes record a squirrel only twice (September 1 and 30) on any of the buildings at camp. Apparently one incentive for invading the camp was the occasional chance to make off with some of the provisions stored there. Most of the local spruces are perhaps too small to be suitable for the location of nests. I have no record of seeing a tree nest there, although some were reported by Charles Schweder and Fred Schweder, Jr. It was apparently for the sake of a more suitable site that the animal took up its abode with its enemy, man.

Habitat

On August 9, while Charles Schweder was walking along the top of the ridge above camp with a screeching young Pigeon Hawk in hand, I saw a Red Squirrel (evidently attracted by the sound) poking its nose out among the uppermost dwarf birches on the slope and even advancing a foot or two into the open Barrens. It was the first adult I had seen thereabouts, except the one frequenting the camp.

Twice in August I made a special hunt for Red Squirrels in the extensive spruce tract west of Four-hill Creek (Harper, 1953:7, fig. 5),

where they were supposed to be common, but I obtained no sight or sound of any. Eventually I prepared ten specimens (nine males, one female) in addition to the youngster of July 24. Of these, six were secured by Fred Schweder, Jr., one by Mike Schweder, and one by Alakahaw, a visiting Eskimo; the dates extended from August 27 to November 4. All were found among spruces, whether in muskegs or on uplands, and at no greater distance than 2 miles from the mouth of Windy River.

Charles Schweder also reported Red Squirrels in "bush" country 20 miles south of Dubawnt Lake. Fred Schweder, Jr., has noticed them on both sides of the upper Kazan River below Ennadai Lake, where there is less forest growth than along Windy River.

Tracks and trails

The tracks revealed by the autumn snows, from September on, left no doubt as to the comparative abundance of the species, although it was still only occasionally that I obtained a glimpse or heard the chattering. Its secretiveness assuredly enables it to elude observation in a remarkable manner. In the spruce muskegs one finds squirrel trails leading from tree to tree, on beds of sphagnum and in the snow—an evidence of dearth of opportunities for progress by means of leaps among the overhead branches. According to Fred Schweder, Jr., the animals do not stir abroad in stormy winter weather, but remain underground.

Food

In early September I found a couple of mushrooms stored by a Red Squirrel about 4 feet up in a small black spruce at the edge of a muskeg. In contrast to the huge and abundant piles of spruce cone fragments that one finds in the Athabaska region, I noticed here only a few small piles. Charles Schweder remarked in October that this was the time of year when the squirrels are busy storing spruce cones. He has seen them cut off the cone-laden tops or branches of spruces, drop them to the ground, descend themselves, and carry off the booty. He has also seen them carrying mushrooms. A Red Squirrel once cached some bones in a tent of his on Goose River, 15 miles south of the upper Kazan River. Fred Schweder, Jr., occasionally secures these animals in his fox traps placed by caribou carcasses in or near timber. Several came to Schuyler traps baited with caribou meat.

Enemies

In the absence of the Marten, possibly Richardson's Weasel is a leading enemy of the species in the Windy River area. It has an

advantage over the larger predators (Mink, Wolverine, Fox, Wolf) in being able to follow the Red Squirrel into its underground burrow. I have recorded elsewhere (1953:66) the capture of one of these squirrels by a Snowy Owl on the ice of Little River.

Economics

The skins fetch a small price in the fur market, and thus offer an incentive to trapping on the part of a boy.

Measurements

On the basis of measurements and weights of the animals, degree of tooth wear, condition of the sutures in the skull, and size and position of the testes, seven of the nine males collected from August 27 to November 4 were young of the year. There was a general, though not altogether uniform, increase in measurements and weights during this period. Arranged chronologically (August 27, September 5, 13, 14, and 30, October 11, and November 4), they were: length, 279, 303, 314, 316, 303, 325, 301; tail, 120, 128, 138, 134, 127, 141, 126; foot, 52, 51, 49.5, 50, 50, 52, 49; ear, 17, 16, 18.5, 18, 20, 18, 17; testes, 5×2.5, 5×3, 6×2.5, 5×3, 4.5×3, 5×3, 5×2.5 mm.; weight, 117.2, 161.8, 168.3, 174.7, 170.7, 193.7, 168.5 grams. In all these individuals except possibly the last (November 4), the testes were not descended. This individual measured and weighed considerably less than the average of the series. Perhaps it had been born considerably later than the others; however, we know as yet comparatively little about dates of litters and the number of litters per year in the far North.

With the foregoing we may compare the measurements and weights of an adult female (October 5) and two adult males (both October 12): length, 319, 333, 312; tail, 129, 138, 123; foot, 50, 52, 50; ear, 17.5, 19.5, 17.5 mm.; weight, 220.5, 237.5, 212.8 grams. These measurements of length and tail average a trifle smaller than those of a series of *T. h. preblei* from the Mackenzie Valley (*cf.* A. H. Howell, 1936:134). In the female the uterus was small and eight mammae were evident. The testes of the males were 10×5 and 8×4 (descended in each case). Most of the specimens, without regard to age or sex, were slightly fat.

Molt

Among the younger males, the hide was prime in three, August 27 to September 13; in one of September 14 it was a little unprime on the chest and about a foreleg; September 30, unprime between the shoulders and on lower back and rump; October 11, dorsum unprime; November 4, generally unprime except on chin, sides of neck, chest, abdomen, and lower back. In the adult female of October 5, the dorsum (except crown) was unprime, and sharply demarked from the prime venter. In one of the adult males of October 12, the hide was unprime on sides of head and neck and on most of the venter from the chest rearward; in the other, it was mostly unprime, except on throat, chest, rump, and inner side of limbs. These data indicate that molt is in progress in both young and old from mid-September to early November.

Coloration

The following color description is based upon the two adult males just mentioned, which have not completed the molt to winter pelage: tip of snout Light Buff to Warm Buff, with a median blackish stripe; top of head, in front of ears, mixed Light Buff and blackish; sides of head gray to buffy, mixed with less blackish than on top of head; ears Warm Buff to Ochraceous-Tawny, mixed with blackish, on outer surface, Warm Buff on inner surface; median dorsal area, from crown to rump, Cinnamon-Rufous; sides of body a mixture of Light Buff to Warm Buff and blackish; lateral line similar, but with a stronger mixture of blackish, and rather faintly indicated; tail above Tawny, bordered with black and Warm Buff, the latter alone forming the outer fringe; tail below a mixture of Light Buff and blackish, bordered like upper surface; hands and feet Cinnamon-Buff to Ochraceous-Buff; underparts Light Buff to whitish, the grayish under fur showing through to some extent.

Two subadult males (August 27 and September 5) correspond fairly well to A. H. Howell's description (1936:134) of the summer pelage of *T. h. preblei,* except that his "under parts and sides" should read "upper parts and sides"; furthermore, the tail (including an inner fringe of black) closely resembles the winter pelage, as described in the preceding paragraph.

The Windy River population is apparently intermediate between *T. h. hudsonicus* (Erxleben) (type locality, mouth of Severn River, Hudson Bay) and *T. h. preblei* Howell, but perhaps nearer to the latter.

Ectoparasites

From each of eight specimens (August 27 to November 4), from one to ten fleas, *Orchopeas caedens* (Jordan), were collected. One of them (September 5) also yielded a mite, *Euhaemogamasus ambulans* (Thorell).

Distribution

In the Athabaska-Mackenzie region (where *T. h. preblei* occurs), Preble (1908:169) records the Red Squirrel from numerous localities, including the country between Fort Rae and Great Bear Lake, and also Fort Anderson. Preble and Seton (1911:343) record a specimen from the eastern end of Great Slave Lake. Anderson (1913:511) found the species on Peel and Dease rivers. I have records (1932:27) from the Tazin and Taltson rivers; Clarke (1940:37) recorded the species at Artillery Lake.

In Manitoba (the domain of *T. h. hudsonicus*) Preble (1902:45) records the Red Squirrel throughout the region between Lake Winnipeg

and the vicinity of York Factory; also a few miles up the Churchill River above its mouth. Anderson (1947:118) includes in the range of *hudsonicus* the "forested areas draining into Hudson Bay in southeastern Mackenzie and southern Keewatin districts; northern, central, and eastern Manitoba"; he adds that it intergrades with *preblei* in northern Saskatchewan. Buchanan (1920:215) records the Red Squirrel in the Reindeer Lake area. In 1945 Manning (1948:25) saw none of the animals, but noted food remains at Sandhill Lake, Manitoba, and Malaher Lake, Keewatin.

Castor canadensis canadensis Kuhl

CANADIAN BEAVER

The country about the northwestern extremity of Nueltin Lake appears to constitute the northern limit of the Beaver's range in this longitude. I owe to Charles Schweder nearly all of the local information obtained. About 1945 he saw one of the animals and some old cuttings on Little River about 6 miles above its mouth; on July 3, 1947, he again saw one in the same locality. The species also occurs on Windy and Red rivers a couple of miles above Simons' Lake; there Charles saw two old and three young ones, and shot one of the animals. He also reported a case of a Beaver in this vicinity digging into a snowdrift on top of the ice and bringing in grass for the construction of a nest. In these localities the animals live in the banks, and build neither lodges nor dams.

Charles and his brother Fred have noted a number of lodges at Moray Lake but not elsewhere along the winter road from Nueltin to Reindeer lakes. Joe Highway reports the species about the south end of Nueltin Lake, at Putahow Lake, and at a small lake about 15 miles west of the last.

Preble (1902:48) reports the Beaver at various places in Manitoba: Oxford House, between Pine and Windy lakes, York Factory, lower Churchill River, North Knife River, and Seal River. Buchanan (1920:215) reports dams north of Reindeer Lake. Anderson (1947:131) includes northern Manitoba and northern Saskatchewan in the range. Manning (1948:25) has a record from Neck Lake, Manitoba. In the Athabaska-Mackenzie region Preble (1908:194) presents records from various localities, including Fond du Lac on Lake Athabaska, the eastern part of Great Slave Lake, Great Bear Lake, and Anderson and Lockhart rivers. Anderson (1913:514) extends the known range to the Mackenzie Delta and the mouth of Peel River. The species has been recorded from the Tazin River (Harper, 1932:28), and from the upper Taltson and upper Snowdrift rivers and Eileen Lake (Clarke, 1940:37).

Dicrostonyx groenlandicus richardsoni Merriam

RICHARDSON'S VARYING LEMMING

Fluctuation in numbers

For this species, in the Windy River area, 1947 was evidently an "off year". During the entire season I trapped only three specimens, while Fred Schweder, Jr., found one dead in November. Even in the best years, as far as I learned, there is no mass occurrence of the species in this area.

Habitats

The first two specimens (June 26 and July 3) were caught at the north end of a sedge bog (Bear Slough), a mile northwest of the mouth of Windy River. One (figs. 3, 4) was in a cavity on the top of a large dry mound (pl. 3, fig. 1); the other, about 20 feet away, was in a low part of the bog, where there were a couple of dozen grass or sedge nests of the past winter (probably of this species rather than of *Microtus*). The third specimen (August 18) was taken on top of a gravelly ridge at the mouth of Windy River. The fourth specimen (about November 18) was found dead on the ice of a lake on Goose River, about 15 miles east of the northeast end of Ennadai Lake. The vege-

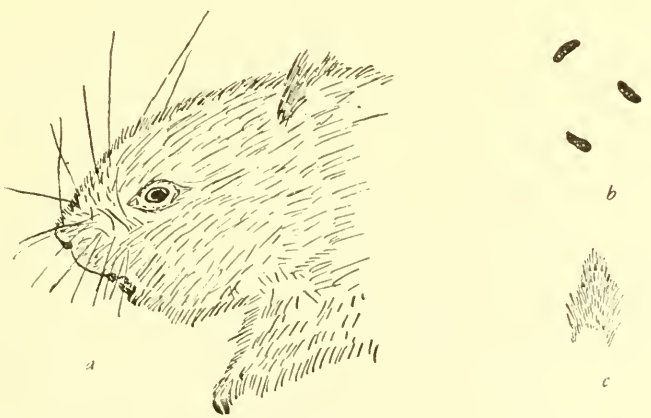

Fig. 3.—Richardson's Varying Lemming, adult female (orig. no. 1050): (*a*) profile (×1); (*b*) scats (×1); (*c*) sole of left hind foot (×1). Windy River, June 26, 1947.

tation about the places where the first three were captured included the following species: trees and shrubs—dwarf birch, *Ledum decumbens, Empetrum nigrum, Vaccinium vitis-idaea* var. *minus, Picea mariana, Vaccinium uliginosum, Salix* sp.; ground plants—*Cladonia* and other lichens, *Sphagnum* and other mosses, grass, *Eriophorum* sp. The animals

chose a wide variety of habitats, from the tops of dry, gravelly ridges to sedge bogs. I gathered from the residents that these Lemmings are perhaps found most commonly in low Barrens. They seem to avoid the timbered tracts.

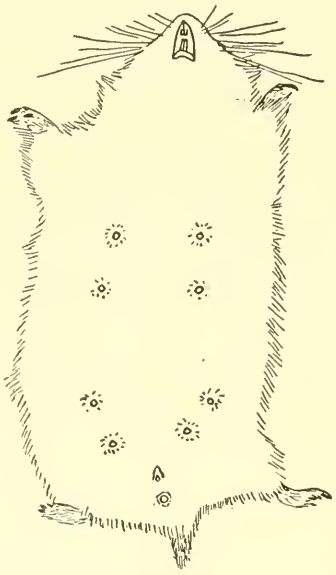

Fig. 4.—Richardson's Varying Lemming, adult female (orig. no. 1050): mastology (×½). Windy River, June 26, 1947.

Tracks

These Lemmings show a distinct penchant for traveling on top of the snow, either on the land or on the frozen surfaces of lakes and rivers. During the fall I found several sets of tracks, but never any indication as to where the animals had emerged from, or re-entered, the snow. The tracks may be readily distinguished from those of mice. The footprints are large and evenly spaced; those of one side are widely separated from those of the other (as might be expected in such a broad-bodied little animal). The trail indicates steady progression by walking or running —not leaping. (*Cf.* Murie, 1954:226, fig. 115b.)

The broad, powerful radius and ulna, suggesting the similar structure in the mole family (Talpidae), are doubtless indications of the Varying Lemming's fossorial ability.

Fred Schweder, Jr., spoke as if it were a fairly frequent occurrence to find individuals running over the frozen lakes in winter as well as over snow in boggy places on land. He had had this experience about

ten times during the winter of 1946-47, for the most part on lakes. He finds Lemmings in this way more frequently than he does any of the mice. When taken in the hand, they never bite. He has not noticed any farther south than the Windy River area. He once found a half-eaten Lemming in a grass nest on top of the ground among some low bushes on a slope on an island in Windy Bay; this was in spring after the snow had gone. In September, 1947, he saw three of the animals running over the ground some 20 miles north of Windy River and tracks of others in the snow. On several occasions in late November he reported tracks on the frozen surface of Windy River.

Mortality

During the following winter Fred "found a family of meadow mouse and a family of lemmings in a big hollow spruce tree 18 miles N. W. from home. All were dead but all good enough to skin." (Charles Schweder, *in litt.*, March 15, 1948.) I wondered if this accumulation of bodies of two distinct species might not represent the cache of a Richardson's Ermine *(Mustela erminea richardsonii)*.

Nests

Charles Schweder spoke of finding a good many grass nests in summer, after they had been uncovered by the melting of the snow; he has also found them beneath stones. In some of these nests there were partly eaten Lemmings. These observations were made chiefly in the Barrens between the Windy and the Kazan rivers. In November, 1947, he noted a number of tracks in this area. He has frequently found Lemmings in caribou carcasses; they occasionally make their nests in the body cavity. He reported (*in litt.*, May 16, 1949) a scarcity of Lemmings and of mice generally during the winter of 1948-49.

Some of the Eskimos (pl. 6, fig. 2) on the upper Kazan River, below Ennadai Lake, prepared a few Lemming skins and offered them to me, but since they lacked skulls and feet, they were scarcely of scientific value.

Reproduction

The specimen of June 26, an adult female, contained five 10-mm. embryos; there were eight mammae (fig. 4), with developed glands; the vagina was perforate. There was green matter in the animal's mouth, including part of a leaf of *Vaccinium vitis-idaea* var. *minus*. Two occipital tufts of fur, shown in a profile sketch, do not arise from the ridiculously short ears, but from behind them. The feet are so thoroughly furred (fig. 3) that the toe pads are concealed. The claws lack the horny excrescences of winter. In an immature female (August 18) the

uterus was small and the vagina imperforate. A subadult female (about November 18), in the whitish winter pelage, had a fairly small uterus and contained no embryos.

Measurements

The measurements and weights of these three females (in chronological sequence) were: length, 145, 95, 126; tail, 11, 14.5 (after skinning), 15; foot, 15.5, 15, 18; ear, 5.5, 4, 2?; weight, 69.7, 18.95, 43.1 grams. A subadult male of July 3 measured: length, 116; tail 10; foot, 17; ear, 8?; testes, 6.5×5; weight, 39.3 grams. It is difficult to secure exact or uniform measurements from such thickly furred little animals.

Molt

Unprime areas were noted as follows: June 26, top of snout and some longitudinal streaks on dorsum; July 3, crown and nape; November 18, streaks and spots more or less throughout, especially on dorsum. In the specimen of August 18 the hide was prime.

Coloration

In the adult female (June 26) the dorsum, from crown to lumbar region, is a mixture of blackish, Argus Brown, and grayish white, changing on sides, from snout to hind limbs, to Ochraceous-Tawny (or Tawny above forelimbs); hairs overlying ears Ochraceous-Tawny; median dorsal streak of blackish only obscurely indicated; rump and area between and below eyes a mixture of blackish and Cartridge Buff; underparts varying from Warm Buff (posteriorly) through Ochraceous-Buff to Ochraceous-Tawny on lower throat; upper surface of hands, feet, and tail Light Buff.

The subadult male (July 3) is similar to the adult female, but the upper parts are darker and duller, with less brown or ochraceous, and the blackish median streak is more distinct; underparts paler; upper surface of hands and feet Hair Brown.

The immature female (August 18) is similar to the subadult male, but exhibits still less brown or ochraceous, and the median blackish streak is still more distinct, extending from the snout onto the basal part of the tail; upper surface of fingers and toes Dusky Neutral Gray; upper surface of distal half of tail Ochraceous-Buff.

In the subadult female (November) nearly the entire body is grayish white, with a faint buffy tinge; upper surface of distal half of tail Ochraceous-Buff. This specimen shows, as a winter condition, the enlarged lower portions of the third and fourth claws of the forefeet.

Ectoparasites

Two of the specimens yielded various mites (*Laelaps alaskensis* Grant and Listrophoridae, hypopial stage, June 26; *Ichoronyssus* sp. and *Myocoptes musculinus* (Koch), August 18) from the body fur.

Distribution

Anderson (1947:148) restricts the range of *D. g. richardsoni* to the Barren Grounds from Churchill north to Tavani Bay and west to Artillery Lake. Within this territory Preble (1902:55) records specimens from Churchill and from camps 25 and 50 miles south of Eskimo Point; and Preble and Seton (1911:345), from Artillery Lake. Shelford (1943:472) discusses variations in numbers at Churchill. Anderson and Rand (1945*a*:304) list specimens from Kazan River and Thelon Game Sanctuary. Manning (1948:25) records specimens from Malaher, Boundary, Carr, and Victory lakes and Lake Ninety-seven, Keewatin; and Gunderson, Breckenridge, and Jarosz (1955:258), from the lower Back River.

[*Lemmus trimucronatus trimucronatus* (Richardson). Back's Lemming. No information was obtained as to the possible local occurrence of this species. It may not range quite so far south in this longitude. Preble (1902:54) collected numerous specimens near the mouth of the Thlewiaza River. Later (1908:181) he mentions specimens from Point Lake, Great Bear Lake, Back and Anderson rivers, and Boothia Peninsula. Preble and Seton (1911:345) have records from Artillery, Casba (=Ptarmigan), and Aylmer lakes. It is abundant on Southampton Island (Sutton and Hamilton, 1932:53). Hornby (1934:109) considered it very scarce on the Thelon River. Degerbol (1935:6) presents records from Baker Lake, Chesterfield Inlet, and Boothia Peninsula; Clarke (1940:37), from Clinton-Colden, Beverly, and Baker lakes and Kazan River; Manning (1943:104), from the Repulse Bay district; and Gavin (1945:229), from the Perry River district, King William Island, and Adelaide Peninsula. Anderson (1947:147) gives its range, in part, as "west of Hudson Bay north of about 60th parallel, to near eastern end of Great Slave Lake," north to Baffin and Banks islands. Manning (1948:25) took specimens at Victory and Twin lakes and Christopher Island, Keewatin.]

Clethrionomys gapperi athabascae (Preble)

ATHABASKA RED-BACKED MOUSE

Numerical status

This is evidently the most abundant mouse of the Windy River area, and probably the one with the least restricted habitat preferences. Of the 41 preserved specimens, 40 came from within half a mile of the mouth of Windy River; the other, from 2 miles upstream. Approximately 62 other individuals (practically all of the normal or red-backed phase) were captured but discarded; some of these were taken at Simons' Lake.

Habitats

The approximate numbers taken in various habitats were as follows: upland spruce thickets, 31; spruce and tamarack muskegs, 20; log buildings, 17; gravelly ridges in Barrens, 14; river bluffs (mostly grown with dwarf birch), 13; willow thickets, 3; sedge bog, 2; peat bog, 2. Few individuals of the other local mice seem to enter the upland spruce thickets, which may be regarded as the most favored habitat of the Redback. It shares the muskegs with *Phenacomys*, and the buildings with *Microtus*. It is evidently the commonest mammal of the dwarf birch thickets on the river bluffs. The number taken in the camp buildings is noteworthy. The climbing ability of the Redback was demonstrated by the capture of two on shelves in a log storehouse, at heights of 3 and 5½ feet, where there was evidence of some minor depredations on provisions.

Some of the commoner elements in the vegetation within a few yards of the places of capture of the 41 preserved specimens were: trees and shrubs—dwarf birch, black spruce, *Vaccinium vitis-idaea* var. *minus*, *Ledum decumbens*, *Salix* spp., *Vaccinium uliginosum*, *Empetrum nigrum*, *Ledum groenlandicum*, tamarack, *Alnus*, *Arctostaphylos alpina*, *Chamaedaphne calyculata*; ground plants—*Cladonia* spp., sphagnum and other mosses, tree lichens, sedges, grasses, rock lichens *Rubus chamaemorus*.

Periods of Activity

Occasional evidence of diurnal activity was obtained. For example, on September 2 two specimens were trapped between 9 a.m. and 3 p.m. Still more striking was the capture of nine specimens in 19 traps between mid-morning and mid-afternoon on October 8. The next day the same traps again contained nine specimens (time of capture unknown); but on October 10, after rain and wet snow during the night, there were only two specimens and practically no tracks. Apparently the Redback is reluctant to stir abroad in wet weather.

Seasonal numbers

A comparatively low July population was indicated by my failure to secure a single Redback in 180 trap-nights at Josie's Bay, from the 11th to the 17th. By mid-August, however, the animals had become numerous about the mouth of Windy River; 32 traps, set among thickets or clumps of dwarf birch, yielded nine Redbacks on August 17, and six more on the following day. Still larger proportionate catches were made in a spruce tract on October 8 and 9, as already noted, when tracks in the snow indicated where the traps could be set to advantage.

Tracks

At least the vast majority of the abundant mouse tracks on the uplands about camp, as revealed in the early, light snows of autumn, must have been made by Redbacks. Some—perhaps most of them—indicated progress by leaping, in the manner of *Peromyscus,* but with shorter leaps than the latter usually takes. The paired prints of the hind feet were a little in advance of those of the forefeet, and wider apart. Merriam (1884:174), nevertheless, reports the gait of the Redback of the Adirondacks as a fast trot, not leaps; and that is my own impression of such Redbacks as I have seen abroad. Accordingly, my identification of the tracks should be regarded as no more than provisional. (*Cf.* Murie, 1954: 219–220, fig. 112.) When the snow became deeper, the tracks were much fewer; the mice, for the most part, probably were burrowing through the snow along the surface of the ground.

Food

A specimen of June 20 had in its stomach what may have been sphagnum moss and a pink berry (possibly a mountain cranberry). Mouse-gnawed mushrooms were in evidence along a ridge near camp, and a trap set on one of them yielded a Redback. These mice came readily to traps baited with cornbread, pecan, and caribou meat and fat.

Ectoparasites

The yield from about 30 of the specimens consisted of 14 species of mites, two species of sucking lice, and two species of fleas. Acarina: *Haemogamasus alaskensis* Ewing (June 19-20); *Euhaemogamasus ambulans* (Thorell) (July 22, August 29-31, October 4); *Ichoronyssus* sp. (August 17-31, September 2); Liponyssinae (nymph) (July 25, October 4-11); *Laelaps alaskensis* Grant (October 4-26); *Haemolaelaps megaventralis* (Strandtmann) (June 20); *Scutacarus* sp. (June 20); *Pygmephorus* sp. (September 14-24, October 26); *Tydeus* sp. (June 14-20); *Erythraeus* sp. (August 17); *Glycyphagus cadaverum* (Schrank) (September 24); *Glycyphagus* sp. (September 14); Listrophoridae (hypopial stage) (July 25, September 23-26, October 4-26, November 4); *Listrophorus* sp. (June 14-20, August 17-31); *Myocoptes musculinus* (Koch) (August 18-31). Anoplura: *Hoplopleura acanthopus* (Burmeister) (June 20, July 23-25, August 17-31, September 23-24, October 4-26); *Polyplax abscisa* Fahrenholz (June 20, August 17). Siphonaptera: *Malaraeus penicilliger dissimilis* Jordan (September 24); *Megabothris quirini* (Rothschild) (September 2).

Injury; pathology

In an adult female of August 29 (fig. 5) the left femur showed an old, healed fracture, with two parts of the bone joining at an angle.

Between July 25 and September 2 six specimens were observed to exhibit an apparently pathological condition on the inner surface of the skin, particularly on the lower back or rump. These areas were discolored as if by distended or broken blood vessels. A similar condition was noted in *Phenacomys (q. v.).*

In skinning the local Redbacks, I experienced unusual difficulty in slipping the tail vertebrae out of the skin. Frequently they pulled apart necessitating a slitting of the tail. This difficulty was much more pronounced in June specimens than in fall specimens.

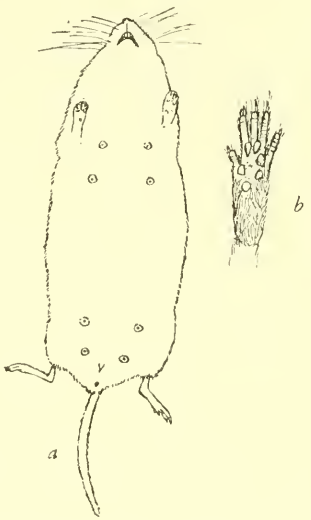

Fig. 5.—Athabaska Red-backed Mouse: (*a*) adult female (orig. no. 1080), mastology (×½), August 29, 1947; (*b*) subadult female (orig. no. 1149), sole of left hind foot (×1), October 31, 1947. Windy River

Reproduction

Embryological data were obtained as follows: June 11, four 7-mm. embryos; June 20, six 14-mm.; August 17, six 17-mm. (in subadult female) and seven 9-mm.; August 29, five 5-mm.; August 31, six 12-mm. and seven 11-mm.; September 14, about five placental scars. No more embryos were found thereafter in the adult and subadult females taken up to November 4. In this area summer practically ends with August; and the breeding of the Redback apparently ceases at nearly the same time. The number of mammae was noted as eight.

In adult males, from June 14 to July 25, testes varied from 12.5×8 to 11×7 mm.; on October 9 (two specimens), from 5.5×3 to 3×1.75

mm. In subadult males, from August 29 to November 6, the size varied from 3×2 to 2×1.75 mm.

Lateral glands

Such glands on the inside of the skin were noted in five adult males (June 14 to July 25); the two largest areas measured were 17×9 and 20×6 mm. An adult female of June 20 also exhibited dark lateral glands, with the usual clear space in the center.

Coloration

At least four distinctive color phases are represented among the local population. The following description of what may be termed the *normal* or *red-backed* (and commonest) phase is based upon seven adult males (June 14, 20; July 20, 22, 25; October 9): dorsum, from crown to rump, between Chestnut and Russet, intermixed with blackish hairs; this color ending rather abruptly at a point more or less midway between eyes and ears; sides and lower rump between Cinnamon-Buff and Deep Olive-Buff; face a little grayer; underparts whitish to Cartridge Buff, the basal part of the hairs being slaty; tail Tawny-Olive to Cinnamon-Buff or Deep Olive-Buff (mixed with blackish) above, Deep Olive-Buff below; hands and feet Pale Olive-Buff. Adult females are essentially like adult males, while juveniles are darker and duller than adults. These specimens are appreciably different from *C. g. hudsonius* Anderson, as represented by specimens collected by Preble in 1900 along the route between Norway House and York Factory, Manitoba (Biol. Surveys Coll.); for example, the face and the sides in these seem grayer, less buffy, than in *hudsonius*. They show some slight differences from material of *C. g. athabascae* (such as lighter upper surface to tail and feet, and less buffy sides); but these are scarcely sufficient to warrant nomenclatural recognition.

Two subadult males (September 2; October 26) are distinctly brighter than any adults, and may be regarded as representing a *rufescent* phase: dorsal coloration variable, approaching Chestnut; ears bright tawny; facial area, sides, and lower rump approaching Tawny-Olive; under parts washed with Pale Pinkish Buff; tail a mixture of blackish and Tawny-Olive above, Cinnamon-Buff below; hands and feet Pale Olive-Buff to Citrine-Drab. The measurements of these two males were: length, 126, 122; tail, 28.5, 28.5; foot, 19, 18; ear, 13.5, 12.5; testes, 2.5×1, 2.5×1.5; weight, 20.7, 19.5 g. (In 1953 I had a similar experience with certain subadults of *C. g. proteus* in the interior of the Ungava Peninsula. They were of a more intensely 'reddish' coloration than any of the normal 'red-backed' adults. Failure to find equally bright-colored

adults in either Keewatin or Ungava suggests that this is only a subadult pelage which passes into a normal 'red-backed' pelage as the animals reach full maturity. Research by Bee and Hall (1956:123-124) on *C. rutilus dawsoni* in Alaska indicates that this transition is accomplished without molt.)

A *gray* phase is represented by one adult female (October 4) and three subadult females (October 9, 25, and 31): dorsal coloration less sharply defined than in normal and rufescent phases, and varying from Fuscous to Dark Mouse Gray (mixed with light hairs); facial area, sides, and lower rump Light Grayish Olive; underparts washed with Olive-Buff or Pale Olive-Buff; chin white in two specimens; hands and feet Citrine-Drab to Dark Olive. Two other specimens (an adult female, September 14, and a subadult male, September 26) are essentially like these, but with dorsal coloration darker (Blackish Mouse Gray) and more distinctly defined; chin white. Specimens in the gray phase constituted approximately 6 per cent of the total catch of the species.

A subadult female (October 11) is a single representative of a *slaty* phase: dorsal coloration solid glossy Blackish Mouse Gray, shading gradually through Chaetura Drab on sides to Deep Mouse Gray on venter; chin white; hands and feet Chaetura Drab; tail Blackish Mouse Gray above, Hair Brown below. This is the most extreme melanistic form in the series.

A juvenal female of August 18 exhibits a bit of aberrant coloration in the shape of a white frontal spot.

In his original account of *C. g. athabascae,* Preble (1908: 178-180) mentions, in addition to the normal red-backed phase, only a slaty or gray phase (with a dorsal stripe of slaty brown), the latter phase representing less than 10 per cent of the specimens taken.

Molt

Unprime areas were noted as follows: June 11, lower throat and chest and behind ears; June 14, large ×-shaped area on dorsum, also left side of throat; June 19, speckling around body; June 20, chest and lower posterior sides; August 17, throughout except on throat and behind ears; August 17, dark specks on dorsum; August 18, entire dorsum; August 29, entire dorsum; August 31, half of dorsum; August 31, small areas on rump and below ears; September 2 (two specimens), black specks on lower back; September 14, dorsum except crown; September 23, crown and nape; September 24, crown, nape, and scapular region; September 26, dorsum; October 4, dorsum and specks on venter; October 9, streaks throughout; October 9, middle and posterior dorsum; October

9, dorsum from shoulders to rump; October 9, posterior dorsum and parts of venter; October 9, dorsum except crown and venter except throat; October 10, streaks throughout; October 11, throughout except face, chin, and legs; October 25, sides of neck, above shoulders, middle of lower back, and buttocks; October 26, crown and upper nape; October 26, rump and streaks elsewhere; November 4, streaks on posterior part of body; November 6, crown, middle of sides, and streaks elsewhere; November 6, scattered spots. From the above it is evident that molt was in progress in June and from mid-August to early November. Prime specimens were noted as follows: two in June, four in July, three in August, and one in October. Seasonal pelages were determined by Handley as follows: late winter, June 11 and 14; summer, June 20 to August 29; winter, September 2 to November 6.

Measurements

The average and extreme measurements of seven adult males were: length, 149 (142-157); tail, 39.3 (35-43); foot, 19.1 (18-20); ear, 13.9 (12-15) mm.; weight, 29.3 (27.1-30.6) grams. Measurements of 10 adult females: length, 144.9 (134-163); tail, 37 (32-46); foot, 19.2 (18-20.5); ear, 14.3 (12.5-15.5). Weight of four nonpregnant adult females, 23.4 (21.35-26.1); of six pregnant adult females, 35.1 (22.9-43.9) grams. The smallest individual was an immature female of August 18: length, 111; tail, 27; foot, 18; ear, 11 mm.; weight, 14.3 grams. Most of the specimens were at least slightly fat.

Distribution

C. g. athabascae, ranging eastward from the Rockies through the basins of the Peace, Athabaska, and Slave rivers, is recorded by Preble (1908:178) no farther to the east than the two last-mentioned rivers. Preble and Seton (1911:344) extend its range to the eastern part of Great Slave Lake; Anderson (1947:152), to northwestern Manitoba. I have recorded (1932:28) specimens from the Tazin River.

According to Anderson (1947:152), *C. g. hudsonius* ranges from Richmond Gulf, Quebec, and Lake Abitibi, Ontario, west to Ilford, Churchill, and Sandhill Lake, Manitoba. Preble (1902:50) recorded Red-backed Mice "throughout the region between Norway House and Hudson Bay," north to the Churchill River 15 miles above Churchill. Manning (1948:26) found *hudsonius* only at Sandhill Lake.

Phenacomys ungava mackenzii Preble

MACKENZIE PHENACOMYS; MACKENZIE SPRUCE MOUSE

Numbers

Trapping returns indicated that among the local small mammals *Phenacomys* was exceeded in numbers only by *Clethrionomys* and *Microtus*. Of 18 specimens obtained, 11 are from the mouth of Windy River, five from Simons' Lake, and two from Josie's Bay. Aside from the 25

topotypes recorded by Preble (1908:177) and A. B. Howell (1926:29) from Fort Smith, Mackenzie, this seems to be the largest series of *mackenzii* known from a circumscribed area. One specimen was preserved as a skeleton, and two in formaldehyde; the remaining 15 are study skins. Of the whole series, nine are adult (June 19 to October 16), five immature (August 21 to 23), and four subadult (September 26 to October 20). Since the above was written, a far greater series has been recorded from Churchill (Foster, 1956).

Ecology

Half of the 18 specimens were obtained in fairly open bogs on mounds or tussocks grown with small black spruces; three in more typical muskegs with a thicker and taller growth of spruce and tamarack; five in an open peat bog at Simons' Lake; and one in scrubby growth on a dry ridge at Josie's Bay. Such a large proportion were found in spruce-grown muskegs or muskeglike areas as to perhaps warrant bestowing the name of "Spruce Mouse" on the species. Until recent years a generally recognized common name seems to have been lacking. The commoner elements in the vegetation noted within a few yards of the places of capture are the following (listed in the approximate order of abundance in each of three categories): trees—black spruce, tamarack; shrubs—*Ledum decumbens,* dwarf birch, *Vaccinium vitis-idaea* var. *minus,* willow, *Ledum groenlandicum, Empetrum, Vaccinium uliginosum, Rubus chamaemorus;* ground plants—*Sphagnum, Cladonia* and other lichens, sedge, grass, *Arctostaphylos alpina,* mushrooms.

Three specimens were taken at entrances to cavities in a dry mound rising out of Bear Slough (pl. 3, fig. 1). It is three or four feet in height and roughly 30 by 15 feet in extent. Its interior would furnish a fairly dry home. At various openings near its base there were considerable accumulations of droppings—some old and black, some fresh and greenish. Observations by Foster (1956:21) at Churchill suggest that these were deposited by *Phenacomys.*

Food

A specimen of June 19 (fig. 6a) had in its mouth half a leaf of mountain cranberry and some comminuted green matter, perhaps of the same food plant. Another specimen, of September 4, likewise had a mountain cranberry leaf in its mouth. An adult of June 23 (fig 6b) and two immature individuals of August 21 had a little green matter in the mouth. Some large brown mushrooms growing on scrubby mounds in a bog had been gnawed by small rodents in August; and the principal

species taken in close proximity to these gnawings was *Phenacomys*. The intestine of a specimen of July 14 contained about 41 scats.

Ectoparasites

Thirteen of the specimens were infested with mites (Acarina): *Haemogamasus alaskensis* Ewing (August 21-22); *Laelaps alaskensis* Grant (June 23, July 3-12, August 21-23, October 16-18); Listrophoridae (hypopial stage) (June 19, July 3-14, August 22, October 18-20); *Listrophorus* sp. (June 23, August 21-23, September 4). Four of the same specimens also harbored sucking lice (Anoplura): *Polyplax abscisa* Fahrenholz (August 21-23). As many as three species of mites and one species of louse were found on a single specimen.

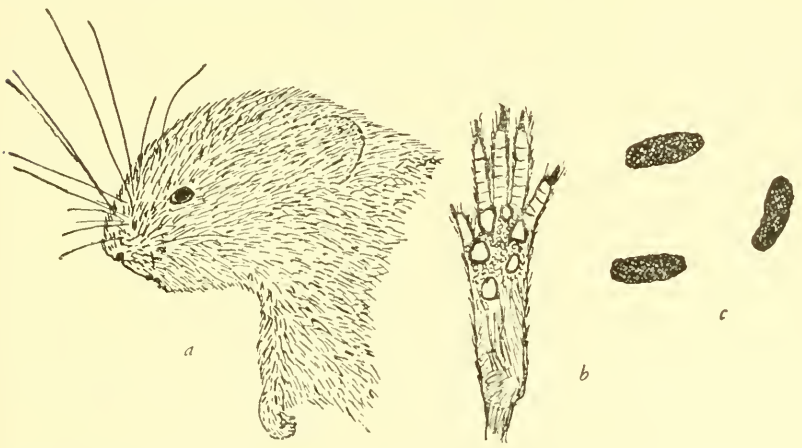

Fig. 6.—Mackenzie Spruce Mouse: (*a*) adult male (orig. no. 1041), profile (×1), June 19, 1947; (*b*) adult female (orig. no. 1047), sole of left hind foot (×2) and (*c*) scats (×2), June 23, 1947. Windy River.

Pathology

Some of the specimens of *Phenacomys* and other mice taken in summer seemed to have a pathological condition; there was a reddish discoloration on the inside of the skin. The areas were discolored by the accumulation of blood and were small. They were noted in *Phenacomys* from July 12 to September 4.

Reproduction

Embryological data were: June 23, six 3-mm. embryos; July 3, five 15-mm. embryos; July 14, uterus swollen, five placental scars; September 4, uterus swollen, four placental scars. All the other females (August 21 to October 20), varying in age from immature to adult, had small uteri

and no embryos. These data, in connection with the age groups mentioned in the first paragraph, might suggest that there is but one litter per year in this area, born in early July. However, the placental scars of September 4 indicate that there may be a second litter in August. In the latter case, the subadult of September 26 (length, 118 mm.; weight, 18.4 g.) may have represented the first litter, and those of October 16 to 20 (lengths, 117-129 mm.; weights, 16.6-21.7 g.), the second litter.

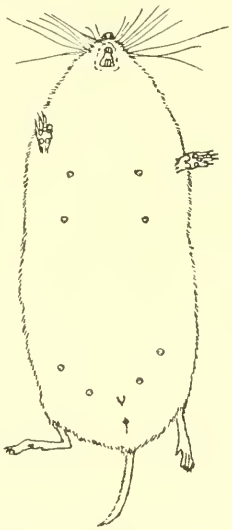

Fig. 7.—Mackenzie Spruce Mouse: subadult female (orig. no. 1089), mastology (×½). Windy River, September 4, 1947.

Eight mammae were noted in adult females on July 14, September 4 (fig. 7), and October 16. The vagina was perforate in adult specimens of June 23 (containing embryos) and July 14 (containing placental scars). It was imperforate in immature specimens of August 22 and 23, in subadults of October 16 and 20, and in an adult of October 16 (no embryos). The testes of adult males measured 7.5×5 (June 19 and 23) and 8×5.5 (July 12); of an immature male, 3.5×2.5 (August 21); of subadult males, 2×1.5 (September 26) and 2.5×2 (October 16).

Molt

Unprime areas were noted as follows: subadult male, September 26, dorsum, except crown and nape; adult female, October 16, small spots throughout, except on crown, throat, and chest; subadult female, October 16, mostly unprime except on crown, nape, throat, limbs, middle of rump, and buttocks; subadult female, October 20, entire dorsum and

streaks on sides and venter. These data furnish definite evidence of a molt in September and October (*cf.* A. B. Howell, 1926:6). Certain other dark areas on the inside of the skin were noted as follows: adult male, June 19, small oval area on posterior right side; adult male, July 12, two dorsolateral areas between arms and legs; subadult male, October 16, posterior flanks. It appears likely that some or all of these may not have represented unprime areas, but hip glands (*cf.* A. B. Howell, 1926:7).

Characters

This Spruce Mouse is a lovely little animal, with its rather robust body and soft, fluffy fur; its ochraceous snout gives it a certain air of distinction. Yet there is sufficient resemblance between it and the local plebeian *Microtus* to cause occasional confusion in offhand identifications of the younger, duller individuals. In the present species the foot is shorter, the tail shorter, slenderer, and more distinctly bicolor, the ear longer and more prominent, and the general coloration somewhat lighter; the brighter-colored snout is diagnostic in the adult.

Coloration

In two adult males and two adult females (June 19 to July 12) the facial area is between Ochraceous-Buff and Ochraceous-Tawny, not sharply defined; rest of upper parts Buffy Brown, mixed with blackish hairs; this color becoming slightly paler on the sides, and brightening toward Tawny-Olive on the rump (brighter in some males than in females); ears generally Ochraceous-Tawny on inner surface toward tip; under parts whitish, the slaty basal part of the hairs showing through; tail rather sharply bicolor, Blackish Brown above, Drab to Drab-Gray below (not usually becoming darker toward tip); hands and feet Light Drab. An adult female of October 16 (presumably in winter pelage) is paler above, near Grayish Olive, and but little brighter on the rump.

Juveniles (August 21 to October 20) have only a faint indication of buffy on the facial area; Brownish Olive above, mixed with blackish hairs, and not becoming brighter on the rump; tail Fuscous above; underparts darker than in adults, the slaty basal part of the hairs showing through more extensively; otherwise colored much like adults.

Measurements

The average and extreme measurements of three adult males (June 19 to July 12) and of five adult females (June 23 to October 16) were, respectively: length, 139 (135-143), 144.6 (137-152); tail, 29.3 (27-31), 32.2 (30-35); foot, 17.5 (17-18), 18.3 (18-18.5); ear, 14.5 (14-15), 13.7 (13-14.5) mm.; weight, 28.4 (26.3-30.8), 31.7 (24.6-36.3) grams. Two of these five females were pregnant,

and weighed 31.9 and 35.5 grams. One immature male (August 21) and four immature females (August 21 to 23): length, 102.5, 107.3 (105-111); tail, 24, 25.1 (24-26.5); foot, 16.5, 16.8 (16.5-17); ear, 11, 11.6 (11-12) mm.; weight, 13.2, 13.8 (12.8-14.4) grams. Two subadult males (September 26 and October 16) and two subadult females (October 16 and 20); length, 123.5 (118-129), 119 (117-121); tail, 26 (24-28), 25.3 (24-26.5); foot, 17.8 (17.5-18), 18 (18-18); ear, 12.3 (12-12.5), 13.3 (13-13.5) mm.; weight, 20.1 (18.4-21.7), 17.2 (16.6-17.8) grams. (On sexual differences in size, *cf.* A. B. Howell, 1926:7.)

Distribution

Other records of the present subspecies include Churchill (Preble, 1902:50; Foster, 1956:18); Lake St. Croix, Fort Resolution, and Fort Smith, Mackenzie, and various points in northern Alberta (Preble, 1908:117; A. B. Howell, 1926:29); Crackingstone Point, Lake Athabaska, Saskatchewan (A. B. Howell, 1926:29); Malaher Lake, Keewatin (Manning, 1948:26); and Fort Reliance (Banfield, 1951: 118). Apparently it scarcely ranges into the Barren Grounds proper, although in the Windy River area it ventures out of the timber tracts into open bogs.

Those who have recently taken up the name of "Heather Vole" for *Phenacomys* seem to overlook the fact that heather (*Calluna vulgaris*) is a European undershrub that has become naturalized in America in certain places that are largely, if not entirely, south of the range of *Phenacomys*. If possibly they mean to convey the idea of a heathlike place, there seems to be no such definition of heather in the dictionaries. In any event, *Phenacomys* is predominantly an animal of forested regions (*cf.* map in Hall and Cockrum, 1953:396, fig. 20).

Microtus pennsylvanicus drummondii (Audubon and Bachman)

DRUMMOND'S MEADOW MOUSE

This Meadow Mouse is common in suitable habitats in the Windy River area. Of the 18 preserved specimens, 16 came from the vicinity of the mouth of Windy River; the remaining two, from Simons' Lake. Approximately 27 other individuals were trapped and discarded.

Ecology

The general requirement, on the part of this mouse, of a fairly dense cover of grasses or sedges restricts its local distribution to a considerable extent. About the mouth of Windy River it was abundant in a riverside meadow covered mainly with blue-joint grass (*Calamagrostis canadensis*); thence it wandered frequently into the adjoining dooryard and log buildings of the little trading post. It also occurred fairly commonly in the sedge bogs, where it occasionally ventured on to the little sphagnous mounds supporting a growth of stunted black spruce. Runways were noted here and there in riverside meadows and in sedge bogs. I also trapped this mouse on a river bluff among dwarf birches and in a thicket of willow and tall grass by a little stream. I did not find it on the open summits of the gravelly ridges in the Barrens nor in the

upland spruce thickets. It was common at the southwest end of Simons' Lake, in beds of grass (probably *Poa alpigena*) on a low sand dune.

At the time of the "break-up" on June 14 the river flooded the meadow near its mouth, but subsided in a few hours, probably with no great damage to the mouse population, unless there were already young in the nests. A female that sought refuge in the camp dooryard at this time contained 18-mm. embryos. In mid-November the river, swollen by an ice jam at its mouth, overflowed this entire meadow and fastened an icy grip upon it. Thus it was ruined as a habitat for the Meadow Mice for the remainder of the winter. The animals could have survived only by a shift of quarters to some suitable habitat until the following summer. Two specimens were trapped in or beside the camp buildings at this time. The individuals that entered the camp buildings evidently caused comparatively little damage; the provisions stored there were mostly on shelves, and thus not so readily reached by *Microtus* as by *Clethrionomys*.

In the summer a number of individuals were observed wandering about the dooryard in the daylight hours. On September 2 two were trapped in a sedge bog between 9 a. m. and 3 p. m. On September 25 a specimen was caught in a runway in snow on top of ice in this bog, just as I had passed a few yards beyond the trap; it was feeding at this time (7.55 a. m.), for its mouth contained a couple of 6-mm. sections of a sedge stem and other material.

Ectoparasites

Like Meadow Mice in general, this subspecies was rather heavily infested with ectoparasites. Sixteen of the 18 preserved specimens, besides 10 of the discarded specimens, yielded nine species of mites, one species of sucking louse, and three species of fleas. Acarina: *Haemogamasus alaskensis* Ewing (August 29, September 2-23); *Euhaemogamasus ambulans* (Thorell) (June 11); *Ichoronyssus* sp. (August 23-29); *Laelaps alaskensis* Grant (June 4-14, July 25, August 21-23, September 2-28, October 1-19, November 5-15); *Laelaps kochi* Oudemans (June 14, September 2, November 15); *Pygmephorus* sp. (June 4); Listrophoridae (hypopial stage) (July 25, August 4, September 25, October 17-19, November 5); *Listrophorus* sp.(June 4-14, August 21-29, September 2, November 15); *Myocoptes musculinus* (Koch) (August 23-29). Anoplura: *Hoplopleura acanthopus* (Burmeister) (August 29, October 19, November 5-15). Siphonaptera: *Megabothris asio* (Baker) (June 12, September 2-6); *Megabothris quirini* (Rothschild) (September 28); *Peromyscopsylla catatina* (Jordan) (August 29, October 18).

Pathology and injury

Several subcutaneous worms were preserved from a specimen of July 25; much of the inner surface of its skin appeared to be in a pathological condition. Three other specimens (August 23 to September 2) also exhibited an apparently pathological condition of the skin (chiefly on the inner dorsal surface), such as has already been noted for *Phenacomys* and *Clethrionomys*. The seasonal incidence of this condition is suggested by the fact that it was noted in the three species only between July 12 and September 4.

An adult male of July 25 had one of its ears chewed off; another, of September 2, had both ears chewed off at the tips. Such mutilation may perhaps be attributed to rival males.

Reproduction

On June 14 six 18-mm. embryos were noted, and on August 21, seven 22-mm. embryos. In adult or subadult females collected from September 25 to October 26 the uterus was small and there were no embryos. The number of mammae was noted as eight.

The testes of adult males (June 4 to September 23) varied from 14×9 to 10×7 mm.; of immature, subadult, or young adult males (August 23 to November 15), from 5×3 to 2.5×1.75 mm. In the adult group, the minimum size of testes was exhibited by the specimen of latest date (September 23). In the other group, an immature male of August 23 (the smallest specimen preserved during the season) had the maximum size of testes (5×3 mm.). There is an evident shrinkage in size with the coming of the autumn and the waning of the breeding season.

Molt

Unprime areas on the inside of the skin were noted as follows: June 14, sides of throat, left side of rump, mid-venter; August 29, irregular patches over most of surface; August 29, middle of lower back and about ears; September 2, about half of surface, in irregular patches; September 23, mostly unprime except on crown, nape, part of throat, and middle of dorsum; September 25, whole surface except chin, crown, nape, and lower abdomen; September 28, whole surface except crown, nape, throat, and legs; October 1, most of surface except crown and throat; October 2, whole surface except crown, nape, throat, and buttocks; October 18, small streaks more or less throughout; October 26, dark streaks or spots nearly throughout; November 5, a few little spots on crown, rump, and lower abdomen; November 15, streaks and spots over much of surface. Molt was thus in progress in June and from late

August to mid-November. Prime skins were noted on June 4, July 25, August 21 and 23, and October 17.

Coloration

Adults superficially much like *Phenacomys,* but somewhat larger, without buffy facial area or brighter coloration on rump; tail stouter, proportionately longer, and in most cases less sharply bicolor, Blackish Brown above, Drab below (becoming darker toward tip); underparts generally darker, and in many cases with a buffy tinge not present in the local *Phenacomys;* upper parts Bister to Snuff Brown, mixed with blackish hairs, and changing insensibly to Saccardo's Umber on sides; hands and feet generally Hair Brown, darker than in *Phenacomys.* The light-colored hairs on the underside of the tail extend up on the sides and in some specimens form a fairly sharp line of demarcation with the dark hairs of the upper side, as viewed from above. But this bicolor effect is not so pronounced in the made-up skin as in the fresh specimen.

Measurements and weights

Six adult males: length, 162 (154-170); tail, 42.3 (36.5-45); foot, 20.3 (20-21); ear, 11.4 (10.5-12.5) mm.; weight, 41.6 (30.4-51.1) grams. Three adult females: length, 163 (151-172); tail, 41.7 (35-45); foot, 20 (18-21); ear, 12.2 (11-13) mm. Weight of two pregnant females, 40.2, 60.5 grams; of one nonpregnant female, 35.9 grams. The smallest specimen preserved was an immature male of August 23: length, 121; tail, 30; foot, 19; ear, 10 mm.; weight, 17.8 grams.

The above measurements of adults are, in general, greater than those given by Preble (1902:52) and Rand (1944:119) for *drummondii*; they indicate an approach toward *M. p. aphorodemus* (type locality, near mouth of Thlewiaza River).

Distribution

Preble (1902:51) reports this subspecies "throughout the region between Norway House and Hudson Bay"; among his localities are York Factory, Cape Churchill, and Churchill. Anderson (1947:155) gives it a range from Alaska and Yukon, mouth of Mackenzie River, lower Anderson and Horton rivers, along the northern limit of trees southeast to Churchill and James Bay; west through Manitoba, Saskatchewan, and Alberta to British Columbia. In the Athabaska-Mackenzie region the more easterly localities mentioned by Preble (1908:186) include the Athabaska and Slave rivers, Fort Rae, and Great Bear Lake. J. A. Allen (1910:10) and Preble and Seton (1911:345) extend the known range northeastward to Artillery and Aylmer lakes; Clarke (1940:38) mentions Clinton-Colden Lake and the Thelon River.

Ondatra zibethicus albus (Sabine)

HUDSON BAY MUSKRAT

The Windy River area seems to represent the northern limit of the Muskrat's range in this longitude. Here I secured definite information

as to its occurrence in a single locality—a short stretch of the river just above (southwest of) Simons' Lake. This is a marshy, deltalike area, yet including a good deal of sand; it is covered largely with willow *(Salix planifolia)* thickets about 10 feet high. The borders of the river and other channels have a considerable growth of sedge (perhaps chiefly *Carex aquatilis*). The river is fairly deep in this part.

The Muskrats do not appear to be at all numerous. According to Charles Schweder, they make no "houses" of the ordinary type, but live in holes in the bank, where presumably the young ones are reared. When the river becomes frozen in autumn, the animals keep holes open in the ice and utilize them as feeding-places. Here they fetch a pondweed (apparently *Potamogeton friesii*), which grows on the bottom of the river. They seem to eat the roots and discard other parts of the plant. The latter are gradually built up into a structure with walls 2 or 3 inches thick, enclosing and roofing over the feeding-chamber beside the hole in the ice. This structure is known locally and elsewhere as a "push-up." It has been described by Rae (1888:142-143) from unspecified northern localities, by Anderson (1913:513) and by Porsild (1945:17) from the Mackenzie Delta, by Ingstad (1933:84) from east of Great Slave Lake, and by Munsterhjelm (n. d.:144) from the Athabaska region, in the range of *O. z. spatulatus*. By mid-winter the animals can no longer keep the holes in the ice open, and thereafter they utilize the holes in the bank. No large mollusks upon which they can feed are known here, but aquatic "snails" *(Lymnaea?)* up to ¾ inch long are reported. The Muskrats are supposed to "freeze out" in some cold winters and die; but some always remain (*cf.* Preble and Seton, 1911:346). In the Mackenzie River region "the musk-rat is subject to periodical murrains, when great numbers lie dead in their nests" (Richardson, 1852:130). In epidemic years, abscesses appear beneath the skin (Ingstad, 1933:76).

The local Muskrats were reported to be considerably smaller than those farther south; yet the specimen collected was a little larger than the average of Manitoba specimens (*cf.* Hollister, 1911:21). The trappers rarely take the trouble to secure any. Their hides have fetched a little more than a dollar.

Near sunset on October 15, as Charles Schweder and I were paddling up the Windy River about ¾ mile above Simon's Lake, a Muskrat swam out from the shore, where it had apparently been perching on a log sloping into the water. After diving once and emerging again, it was shot. It proved to be an adult male: length, 568; tail, 247; foot, 74; ear, 20; testes, 14×7 (not descended). The general color of the upper parts is Prout's Brown, overlaid on crown, back, and posterior sides with longer

blackish hairs; gradually changing to Sayal Brown on venter; cheeks, chin, throat, breast, and anal region Pale Pinkish Buff; a narrow median dusky stripe on chin; upper surface of feet near Hair Brown. The hide was unprime, except on snout, chest, sides of nape, and limbs. The specimen yielded several mites (*Laelaps* sp.).

The Muskrat is reported by Charles Schweder as more or less common about the south end of Nueltin Lake and along the Kasmere and Cochrane rivers; and by Joe Highway at Putahow Lake.

The business of muskrat ranching seems to be highly organized in the area about The Pas. Thomas Lamb remarked on the frequent occurrence of albinos thereabouts. This present state of affairs is interesting in view of the fact that the type specimen of *Fiber zibethicus-albus*, described by Sabine in 1823 from Cumberland House, Saskatchewan (some 40 miles west of The Pas), was also albinistic.

This subspecies has been recorded from The Pas, Echimamish, Hill, Nelson, and Steel rivers, Hairy Lake, Robinson Portage, York Factory, and Churchill, Manitoba (Preble, 1902:53; Hollister, 1911:20, pl. 1); also from Reindeer Lake and Churchill River (Buchanan, 1920:215). Anderson (1947:164) includes in its range "waters draining into Hudson Bay from the west . . . ; north to the Barren Grounds."

Some of the more easterly records of the neighboring subspecies, *O. z. spatulatus*, in the Athabaska-Mackenzie region are: streams southeast of Lake Athabaska, Chipewyan, Resolution, Fort Rae, and lower Anderson River (Preble, 1908:191); not much east of the Coppermine River on the Arctic coast (Anderson, 1913:513); mouth of Taltson River (Harper, 1932:28); Artillery, Ptarmigan, and McDonald lakes (Clarke, 1940:38).

Erethizon dorsatum dorsatum (Linnaeus)

EASTERN CANADA PORCUPINE

The hitherto unpublished information given below was supplied by Charles Schweder. There were a few Porcupines in the Windy River area in 1944-45, but none were noted during the next two years. One was killed by a Chipewyan about 3 miles above the mouth of the river. There was another 18 miles north of the Windy River; its tracks were noted, and the tamaracks it barked were in evidence for a considerable time. The species hereabouts feeds mostly on tamarack; also on spruce and willow. In 1946 a Porcupine made its presence known on the Kazan River 15 miles below Ennadai Lake. It gnawed the bark from a whole tamarack tree and gnawed about the door and windows of a log cabin. The near-by Eskimos know the species. Previous records from Keewatin were apparently lacking.

The animal is fairly common about the south end of Nueltin Lake, and thence to Reindeer Lake, especially along the Cochrane River. About

May, 1942, on Nueltin Lake 20 miles south of The Narrows, Charles found a Cross Fox that had had a fatal encounter with a Porcupine; there were quills sticking in its nose and eyes. The Fox's body had been mostly eaten, as if by the Porcupine, for no tracks of other animals were visible in the snow.

Preble (1902:59) reports the Porcupine "throughout the region between Lake Winnipeg and Hudson Bay"; specific localities are Nelson River House on the Churchill River, York Factory, and the headwaters of the Shamattawa. He also notes Hearne's old record from north of the Churchill River (in the vicinity of Seal River). Buchanan (1920:215) apparently found the Porcupine no nearer to Reindeer Lake than Sandy and Island lakes on the Churchill River. Anderson and Rand (1943:302) record specimens from Thicket Portage (Mile 165, Hudson Bay Railway), Herchmer, and Sandilands Forest Reserve, Manitoba.

Some of the more easterly localities reported in the Athabaska-Mackenzie region are: Cree Lake, Firebag River, Fond du Lac, and east end of Great Slave Lake (Preble, 1908:197); also mouth of Taltson ("Rocher") River and The Narrows of Great Slave Lake (Preble and Seton, 1911:346), and Lynx Lake, on the upper Thelon River (Banfield, 1951:119). Anderson (1947:172) reports the present subspecies ranging west to northern Saskatchewan, and apparently intergrading with *E. d. myops* in Wood Buffalo Park, northern Alberta.

Delphinapterus leucas (Pallas)

WHITE WHALE; BELUGA

Nearly all the following local information was supplied by John Ingebrigtsen, of Churchill. As soon as the ice in the Churchill River breaks up in the spring, the White Whales come in from Hudson Bay. As many as 500 or 600 have been seen arriving on one tide. They stay in tide-water, not going more than 6 miles up. Very few come in after the first week of September. There are more in the Nelson River and in the intervening streams than at Churchill. During the first month the little ones ride up the river on the mothers' backs ("Eskimo style"); they look like black bumps, about 3 or 4 feet long (see the quotation from Pennant in a subsequent paragraph). Later they swim alongside the mothers. By early July they are 4 or 5 feet long and weigh about 150 pounds. Ciscoes (perhaps *Leucichthys churchillensis* Fowler, 1948) come up the river at the same time, with every tide. The whales are presumably following these fish to feed upon them; but their stomach contents are ground too fine to be identifiable. Doan and Douglas (1953:13) indicate that Capelin *(Mallotus villosus)* are the chief food on the shores of Hudson Bay.)

All the larger individuals are white. A big one is about 25 feet long and weighs about 1500 pounds. Some of the Churchill residents pursue them in canoes with outboard motors and harpoon them for use as dog

feed. A can at the end of a rope serves as a float. A rifle may be used in addition to the harpoon. About 200 of the whales, at least, are captured every year. Almost the only use hitherto has been for dog feed, although some oil has been extracted and shipped away. The skin is not generally used, although, when tanned, it makes a very strong leather. At first it appears about a quarter of an inch thick, but it is thinner after tanning. In December I noted some of the whale meat in a warehouse at Churchill.

Mr. Ingebrigtsen has frequently seen and heard the White Whales blowing out in the bay, but at no great distance from shore. The species is very seldom seen, he said, as far north as Dawson Inlet.

On September 18, 1947, at Nueltin Lake, we heard a radio broadcast concerning a possible new industry for Manitoba—the processing of White Whales from Churchill for oil and hides. About a dozen specimens, averaging perhaps 1,000 pounds in weight, had been shipped to Winnipeg for experimental processing. A possible further use consisted of making the meat available for fox ranches. The subsequent development of this industry is the subject of a report by Doan and Douglas (1953), who also discuss the habits and life history of the species on the west coast of Hudson Bay (Churchill, Seal River, Nunnula, Tavani, Term Point, and Chesterfield Inlet).

The Beluga "haunts the mouths of rivers [entering Hudson Bay] in *June*, as soon as they have discharged the ice, and are taken in great numbers. . . . A young one has been seen (as is their custom) mounted on the back of another." (Pennant, 1792:ccxcvii.)

According to Preble (1902:40), the species occurs all along the coast of Hudson Bay, including Hayes and Churchill rivers. Feilden (1887:347) records it from Churchill; Sutton and Hamilton (1932:92), from Southampton Island; Anderson (1947:86), from Hudson Bay. Walker writes (1931:472) that "the prevalence of numerous white whales in the harbour and for six miles up the [Churchill] river precludes the use of drift-nets" for commercial fishes. Freuchen (1935:265) gives an extensive account of the species, with records from Southampton Island, Roe's Welcome, Port Nelson, Eskimo Point, Chesterfield Inlet, and Frozen Strait. Manning (1943:105) reports it as numerous in Repulse Bay.

Canis lupus hudsonicus Goldman

KEEWATIN TUNDRA WOLF

Numbers

Wolves apparently occur in fair numbers throughout the Barren Grounds of southwestern Keewatin, and also in the sparsely timbered country on the south. Probably there is scarcely a square mile in all

this region where they do not wander with more or less frequency. Just how distinct they may be on opposite sides of the broad and well-nigh intangible boundary between the Arctic and the Hudsonian zones, and whether either of the two presumptive forms (*hudsonicus* and *griseo-albus*) makes extensive forays into the territory of the other, are questions on which fuller light than we possess at present is much to be desired.

Measurements and coloration

Two adult specimens were brought out. One (a female) had been taken by Charles Schweder in January, 1947, on the Windy Hills a mile south of the mouth of Windy River; it was left in a frozen state till the following June 14, when it was skinned. It had been thus neglected owing to a pronounced drop in the fur-market prices. The collector estimated its weight at 60 pounds. His measurements (converted from inches into millimeters) were: length, 1,512; tail, 381; foot, 305; ear, 95. The general color is pale creamy white, varying to Cream-Buff on the mid-dorsum and to Cartridge Buff on the face and legs; a few black-tipped hairs on the tail, especially along the mid-dorsal, basal part; also a slight sprinkling of such hairs on the median line of the dorsum, from crown to lumbar region; upper throat Avellaneous, changing on chin to Hair Brown, streaked with white; border of lower lip Mummy Brown; posterior mid-venter Vinaceous-Cinnamon; under fur Pale Neutral Gray to white; nails dark brownish, tips horn color.

On September 6, 1947 (a raw, cloudy day with a brisk north wind and several snow flurries at temperatures a degree or two above freezing), Fred Schweder, Jr., noticed a Wolf just as it came out of the water on the southwestern bank of Little River a mile or so above its mouth. It shook the water off its fur as a dog would have. This was the only time in Fred's experience that he had had direct evidence of swimming on the part of a Wolf. As it proceeded southwestward toward the tract of spruce timber along Four-hill Creek, Fred endeavored to intercept it while keeping under cover of the rolling contours of the Barrens. In this manner he kept ahead of it, with the wind in his favor, for a distance of a couple of miles, until he reached the timber tract. There, giving up hope of getting within reasonable range, he risked a shot with his .30-.30 at a distance of half a mile. The bullet struck beyond the Wolf, which thereupon turned in Fred's direction and actually passed within 40 yards of his place of concealment in a spruce thicket. A second shot dropped the animal in its tracks. It proved to be a male, slightly fat, with an estimated weight of 90-100 pounds (pl. 3, fig. 2.; pl 4. fig. 1; pl. 5, fig. 1). Its measurements were: length, 1,670; tail, 505 (515 after

skinning); foot, 287; ear, 115; height at shoulder, 860; shoulder joint to hip joint, 660; girth of neck in front of shoulder, 500; girth of body behind shoulder, 830; girth of foreleg below elbow, 220; testes, 35×24. The iris was yellow, with a brownish tinge. No ectoparasites were detected. The hide was prime; it weighed 10 pounds when fresh. The uncleaned skull (with lower jaw) weighed 5 pounds.

The general color is pale creamy white, varying on the legs between Cartridge Buff and Cream-Buff; a wash of Cartridge Buff along sides and on buttocks; a dorsal stripe of black-tipped hairs from crown to end of tail (3-inch tip of latter mostly black, with a few white hairs); top and sides of head (to below and in front of eyes) a grayish mixture of black and white hairs; from in front of eyes to nostrils a mixture of Hair Brown and white hairs; outer surface of ears varying from Cream-Buff basally to Cartridge Buff apically, with an increasing mixture of black hairs toward tip and margins; inner surface of ears whitish; upper throat Pale Vinaceous-Fawn, varying to Mummy Brown along border of lower lip; posterior venter Light Vinaceous-Cinnamon; underfur Pale Neutral Gray to white; nails fuscous.

Five odd skulls were secured. I picked up one in the spruce timber west of Four-Hill Creek. In September I noticed four skeletons not far from camp, and learned that the animals had been trapped by Charles Schweder approximately in February, 1943, in sand-ridge country at various places along the upper course of Red River, east of Ennadai Iake. The bodies had been brought on a dog sleigh to the vicinity of camp, and had been skinned in the following May. I gathered three of the skulls as specimens. A little later I picked up another skull; this animal had been captured at Simons' Lake by Fred Schweder, Jr., in 1942 (probably May).

Measurements of skulls (including those of the type of Goldman's *hudsonicus* from Schultz Lake, of the above-mentioned male and female from Windy River, and of three other animals from Red River and Simons' Lake) are given in the accompanying table. In the case of the odd skulls from the two last-mentioned localities, the sex is provisionally indicated on the basis of size. Some of my measurements of the type skull differ slightly from those supplied by Goldman (1944:429).

Local range and habitats

According to Fred Schweder, Jr., the Wolves are commoner on the Barrens extending north to the Kazan River than they are about Windy River. Beyond the Kazan they are reported by Charles as far as the Little Dubawnt River. He spoke of seeing, on the average, perhaps 15

MEASUREMENTS OF SKULL OF CANIS LUPUS HUDSONICUS, KEEWATIN

	Average of two	1090 (FH) ♀ ? Red R.	1049 (FH) ♀ Windy R.	Average of four	1096 (FH) ♂ ? Simons' L.	1091 (FH) ♂ ? Red R.	1094 (FH) ♂ Windy R.	180281 (USNM) ♂ Schultz L.
Greatest length	242.0	242.0	242.0	260.9	257.5	263.0	268.0	255.0
Condylobasal length	225.8	225.5	226.0	241.3	241.0	242.0	244.0	238.0
Zygomatic breadth	127.5	128.0	127.0	140.8	136.0	137.0	144.0	146.0
Squamosal constriction	77.5	76.0	79.0	80.7	76.6	81.0	81.5	83.8
Width of rostrum	41.0	42.0	40.0	44.3	42.5	46.5	42.5	45.5
Interorbital breadth	43.3	45.5	41.0	47.7	48.5	46.4	49.0	47.0
Postorbital constriction	41.3	40.0	42.5	41.4	42.4	40.0	41.5	41.5
Length of mandible			173.0	185.5	185.0	185.0	192.0	180.0
Height of coronoid process			68.0	78.9	74.2	76.5	80.0	85.0
Maxilliary tooth-row, crown-length	103.8	103.0	104.5	110.6	110.5	110.0	112.0	110.0
Upper carnassial, crown-length	24.8	25.0	24.5	26.7	26.5	27.5	26.0	26.7
Upper carnassial, crown-width	13.2	13.4	13.0	14.5	14.5	14.0	15.0	14.5
First upper molar, antero-posterior diameter	17.2	17.4	17.0	17.6	17.0	18.5	17.5	17.5
First upper molar, transverse diameter	23.0	23.0	23.0	23.8	22.5	24.5	24.0	24.0
Lower carnassial, crown-length			28.5	31.1	29.8	32.0	30.0	32.5

to 20 Wolves in the open during the course of a year. He reported (*in litt.*, March 15, 1948, and May 16, 1949) "lots" of them during the winters of 1947-48 and 1948-49. He also referred to their irregular occurrence in winter; they may come to a given locality at intervals of a couple of weeks, to feed on what caribou bodies they can find, and then be absent in the meantime. The Wolves may seem to follow the Caribou southward in winter as the latter pass from the Barren Grounds into the wooded country, but it is difficult to tell. Those that stay far north on the Barrens in winter must feed to a considerable extent on the carcasses of

Caribou killed in autumn. For the latter very largely desert the Barrens of southwestern Keewatin during the colder months; perhaps once in three years they may remain, and sometimes in considerable numbers. It would be rash to infer that the Wolves consciously and purposely kill beyond their immediate needs in autumn, in order to provide a reserve supply of food for the coming winter; yet their habit of only partly consuming a fall-killed Caribou undoubtedly does make provision for winter needs, however unintentional the act may be.

Although Charles Schweder said he had no idea of the range of an individual Wolf, he did refer to one that followed his trap-line in the winter of 1946-47 from the third esker beyond the Kazan River as far as the Little Dubawnt River—a distance of 40 miles. It would turn his traps upside down, sometimes springing them.

The Wolf, like the Red Fox and the Arctic Fox, shows a distinct predilection for sandy country, presumably because of the ease of digging dens in such soil. Thus the sandy eskers are said to form a favorite haunt during the breeding season. At other seasons Wolves evidently wander widely over all sorts of terrain. Charles is inclined to believe that they stay in the open throughout the winter, without retiring to a den to sleep or even burrowing into a snowbank.

Although a Wolf's sight and hearing are very keen, Charles stated that one might approach a man right in the open, provided he sat quietly. In the latter part of May, 1947, an adult female came within 500 feet of a rock enclosure ("Pile o' Rocks") a mile northwest of the camp on Windy River. Charles fired from within the enclosure and shot one of the Wolf's hind legs off. He then chased it for 3 miles before securing it. Its fresh hide was nailed to the inner wall of the camp when I arrived on May 31. In Charles' opinion, the Wolves hunt more by day than by night. Once, when Fred's dogs dashed up to a young Wolf in a trap and bit it, the latter never fought back; it had not been in the trap more than one night. A trapped Wolf may bend the instrument of torture with its powerful paws; it may also break some of its teeth on the trap, but this is not a usual happening.

On August 20, in mid-afternoon, I was walking along the border of an open bog (Bear Slough) when I suddenly became aware of a large white Wolf loping over the bog near its farther edge, perhaps 200 yards away. How it came to allow such a close approach, I could never understand. It dashed through a thicket to some higher ground on the border of a tundra pond, jumped across the outlet, and continued up a rather open slope till it disappeared over the sky-line nearly half a mile away. It had barely paused a time or two to look back at me. Its primary aim

was evidently to put plenty of distance between itself and the unarmed human intruder into its haunts. It was distinctly thrilling to secure this one-glimpse-in-a-lifetime of a Wolf in its native wilds. The impress of one of its feet in soft earth by the tundra pond measured 90 mm. in width and 119 mm. in length (including the claw mark). In October the print of a front foot on a sandy beach at Simons' Lake measured approximately 6 inches (152 mm.).

Dens

On June 12 Charles Schweder drove his dogteam 4 miles over the ice of Windy Bay to show me a couple of dens in a spur of the huge "Wolf Esker," which forms a prominent landmark overlooking the junction of Smith and Windy Bays. On all sides the impressive, lonely hills of the Barren Grounds stretched away in endless succession to the horizon. The dens were about 18 feet apart, at the edge of a spruce thicket; one of them extended beneath a thick snowbank (pl. 4, fig. 2). The entrances had been blocked up by Charles on the previous day, and there was no evidence of attempts on the part of the parent Wolves to dig out the problematical cubs. One of the entrances was approximately a foot and a half in diameter. In the vicinity there were a few old scats and one that was fairly fresh. On a higher level, near the top of the esker, was a bare spot that may have served as a lookout point for the old Wolves. Tracks in it measured about 4 by 5 inches.

Relations to Caribou

The first choice of food for the Wolf, as well as for the human natives of the region, is caribou meat. But it is virtually axiomatic that no predatory species (other than modern man) exterminates its own food supply.

During three or four months of the year (say late June to September or October) the Caribou's readiest means of escape from its chief natural enemy is by water. There is always some lake, pond, or river so close at hand that the Caribou can cover the distance to it at a better rate than its pursuer. Its superior speed in the water is probably so well understood by the Wolf that the latter presumably desists, as a rule, at the water's edge.

It is quite another story when the Barrens are in the grip of winter and there is no escape by water. It is perhaps significant that most of the locally reported killings by Wolves have taken place on the ice of lakes. It would be difficult to say whether these animals have deliberately driven their victims on to the ice, to get them at a disadvantage, or whether the Caribou themselves have chosen such a place

for their last stand. It might be reasonable to assume that claws and rough toe pads are better adapted than hoofs for quick turns or other movements on ice. A fall on the slippery surface, after being brought to bay, would be almost certainly and quickly fatal to a Caribou.

A Caribou fawn, at an age of no more than a couple of months, is said to be able to outdistance a Wolf if the chase is not too prolonged; it will tire sooner, however, and so may be captured eventually.

I owe to Fred Schweder, Jr., the following accounts of pursuit of Caribou by Wolves. In a number of years of experience on the Barrens, these were apparently the only cases that had come to his personal attention. His brother Charles spoke of practically never seeing a Wolf following any of these animals; also, of knowing no case of Caribou killing a Wolf in self-defense.

In May, 1945, a black Wolf was seen in brief and silent pursuit of a hundred Caribou on the ice of Windy Bay. In October, 1946, Fred watched a Caribou on the ice of Nueltin Lake, as it kept two white Wolves at bay during the last two hours of daylight. The next morning it was dead, and half eaten. On October 16, 1947, four fast-traveling Caribou at Simons' Lake were being followed by a white Wolf half a mile in their rear.

November 7, 1947—a day of blizzard, with the air full of drifting snow—found Fred at one of his trapping camps 10 miles north of Windy River. Three animals came dashing up through the storm, and at first he took them all for Caribou. By the time he recognized the animal in the rear as a Wolf, and fired, it had gotten to a distance of about 100 feet; it was merely wounded, and escaped.

In the last week of November Fred found two full-grown bucks and a doe on the ice of Windy Lake, where they had been killed by Wolves. The two former were so-called "stink bucks," with flesh rendered unfit by reason of their rutting condition, and so they had not been eaten since their death, apparently several weeks previously. The doe had been killed more recently (perhaps a couple of weeks previously), and was still only about half eaten.

The stomach of a wolf collected on September 6 was crammed with several pounds of caribou meat.

In mid-October Charles Schweder pointed out to me a partly eaten Caribou, with antlers in the velvet, lying in a little pond by a willow thicket just above Simons' Lake. He surmised that the animal had been killed by Wolves.

The food remains that Charles has noticed about the dens consist of caribou hides and bones. He believes the animals will gnaw off the

hind leg of a caribou carcass and carry it (rather than drag it) to the den. He has found no evidence that Arctic Hares are used as food.

The local trappers, while concentrating on Arctic Foxes, appear to make no great effort to secure Wolves except as they become a pest on the trap-line by tearing up the captured Foxes, without eating them. Fred Schweder, Jr., spoke of one band of four and another of seven following his trap-line and destroying the Foxes. Although the ordinary fox trap generally fails to hold a Wolf, Fred secured 15 specimens during the winter of 1946-47. Fish as well as Caribou serve for bait. A Wolf generally walks all around a fish bait before seizing it, and in the process it may step into the single trap placed there.

Joe Chambers, a trapper of Goose Creek, 10 miles south of Churchill, spoke of finding a number of dead Caribou, with only the tongues and the unborn young eaten out by Wolves.

Relations to man

Aside from diseases and parasites, virtually the only enemy of the Wolf in this region seems to be man. According to Charles Schweder, the Eskimos (pl. 6, fig. 2) apparently make little or no effort to secure Wolves, as if they might be somewhat apprehensive of them.

Disease

Charles Schweder had never heard of a normal Wolf attacking a human being in this region. But he had a report of one in the spring of 1947 that was presumably suffering from disease (encephalitis?—*cf.* Clarke, 1940:72) and attacked an old man on North Knife River, Manitoba; it bit him in the hand and arm and tried to get him by the throat. The man seized the animal by the ears and held it under water till it was drowned. During the same season another Wolf (presumably likewise afflicted) was reported by John Ingebrigtsen to have been run over by an army truck on a road near Churchill. Robert Urquhart, of Churchill, spoke of getting his hands infected during the previous year through handling mangy or otherwise diseased wolf and fox skins. Apparently this condition among the animals was serious and wide-spread.

Voice

Charles Schweder states that the Wolves howl mainly in winter, and only infrequently in summer. He has heard them both by day and by night. He thinks the purpose of the howling is to call others. A Wolf may be heard in one place, and then another answering from a distance. In the middle of a certain night, approximately in the early part of August, 1947, Fred Schweder, Jr., heard three or four Wolves howling

among the Windy Hills, at a distance he judged to be about 2 miles. With a good wind, he said, they can be heard at twice that distance. On the present occasion the howling lasted about 20 seconds. The animals seemed to be staying in one spot. During the previous winter, along his trap-line extending north to the Kazan River, he had heard Wolves howling almost daily. In his experience the principal vocal season extends from November to January. He said a single howl will last about 4 seconds. When the dogs hear it, they will generally respond in kind.

One of my fondest desires on the Barren Grounds came to fulfillment on November 15, when I finally heard this wolf music with my own ears. About midday, when 10-year-old Mike Schweder and I were up the river a short distance above camp, he heard the sound several times, but it did not come clearly to my duller ears; all I made out was a sort of distant *mmmm*. At dusk, while we were sawing wood at camp, Mike drew attention to the sound once more. It was in the direction of Windy Bay, apparently at a distance of a mile or less; and it was repeated a couple of times while we listened for some minutes. It was a softer call than I had anticipated; there was nothing in the least fierce or terrifying about it—just a gentle *wooo-oo^{oh}!* (with a rising inflection). It was scarcely even doleful. I could imagine the animal pointing its nose in the air and emitting a little vaporous cloud in the frosty atmosphere (temperature 3 or 4 degrees above zero). There was no answering cry anywhere, at least within the range of our hearing. It sounded as if the animal were purposely uttering a fairly low note, not letting itself go with anything like all its might. In fact, it was one of nature's pleasant sounds, more subdued or restrained by far than the somewhat cacophonous ululations of the Husky dogs. (None of the latter were in camp at this period.)

There was a much more prolonged musical performance by the Wolf just a week later. In the early afternoon a visiting Cree trapper was hitching up his team at camp, and the yelping of his excited dogs was thought to have started the Wolf off. The sound came from beyond the mouth of Little River, at a distance of about a mile. I set out with the idea of possibly seeing the animal, or at least getting closer to it, but deep snowdrifts and a temperature just a little above zero discouraged me after half a mile. The sound kept coming at intervals during half an hour or so, from the farther side of a ridge. Meanwhile a distant bird (doubtless a Raven) was seen flying toward the approximate spot. Perhaps the Wolf was feasting on some Caribou that had been killed thereabouts several weeks previously.

There was a certain amount of variation in the howls. Most of them

seemed to last about 3 seconds. Some sounded like those of the previous week. One kind bore some resemblance to a dog's barking: *wooh-wooh-wooh-woo-oo$^{oh!}$* I set down still another as *oooo-oooo-oooh*. And these were not the only variations. A striking characteristic was the low pitch of the howls. It was a slow, agreeable, extremely interesting sound, and distinctly doglike. The atmospheric conditions were superb—one of those fairly bright and nearly calm days of an Arctic winter. The treeless summits of the ridges, the snow-laden spruces in the hollows and on the slopes, the drifts with their sides more brightly illuminated than their tops by the low midday sun—these made a fascinating picture of the Barrens in their winter garb and a peculiarly appropriate setting for the melody beyond the ridge.

At dusk Mike heard the Wolf a couple of times more; but when I went out of the cabin to listen, there was silence. Although there was a half-moon shining brightly over the hillock across the river, my friend Fred did not think that the Wolf becomes inspired in the manner of a dog baying the moon. There were stars but there was no aurora in the clear sky; there was still some light in the west; and the air was so nearly still that I almost had to watch the smoke from the cabin chimney to be certain of a zephyr out of the northwest. The temperature was then several degrees below zero. An hour and a half later Mike reported another howl.

Reproduction and growth

I secured no particular local information on the mating season, which is presumably in late February or March. According to Charles Schweder, the young are born in April or May. He has determined the number of cubs by digging out about half a dozen dens. The usual number seems to be seven, but once he found three. The male parent remains with the family and helps by bringing food. On June 21, 1947, Charles saw an adult Wolf, accompanied by a half-grown cub, on Goose River, some 25 miles south of the Kazan River. By September, he said, the young will resemble the adults in color and closely approach them in size; by November it becomes difficult to distinguish them by size.

Numbers in a band

When Charles finds the tracks of a band of Wolves, they generally number seven, but he has also noted three and four. He is inclined to believe that such a band represents a family party, but that it may include merely the members of one litter, without their parents. Once in the fall he noticed two old Wolves and seven young ones together.

Distribution

In May the Mounted Police at Churchill reported a good many Wolves being brought in for bounties. Joe Highway, a Cree trapper, reported Wolves about the south end of Nueltin Lake, where they are of apparently the same size and color as those about the north end. The Chipewyans at the south end of the lake are said to get comparatively few Wolves. About Reindeer Lake the animals (presumably *C. l. griseo-albus* Baird, 1858) are said by Charles Schweder to be much smaller than, though of approximately the same color as, the Barren Ground Wolves. On the other hand, the measurements given by Anderson (1943:388), by Goldman (1944:429), and on preceding pages of the present account, indicate that *griseo-albus* is the larger animal of the two.

John M. Bourassa told of chasing three Wolves *(C. l. occidentalis)* with a plane over Yellowknife Bay, Great Slave Lake, in March, 1947. Two of them were black. The other, a white animal, took a zigzag course when pursued, looking first over one shoulder, then over the other, and finally it threw itself on its side as the plane skimmed over it.

Wolves are so thoroughly distributed in Keewatin and adjacent regions that there is little point in citing published records at great length. Goldman (1944:428) gives the range of *C. l. hudsonicus* as "northern Keewatin, including the northwestern coast of Hudson Bay (Cape Fullerton), and west to northeastern Mackenzie (Back's River, 20 miles below Lake Beechey)." His map (fig. 14, p. 414) indicates a much wider range, extending south to northeastern Saskatchewan and to Lake Winnipeg, Manitoba. Among the nine specimens of this subspecies that he examined, there are three from Schultz Lake and one from Wager River. Preble (1902:61) found the species fairly common 25 miles south of Eskimo Point. Sutton and Hamilton state (1932:33) that the Wolf is rare on Southampton Island, where it feeds principally on Caribou and takes Arctic Foxes out of traps. It became extinct there by 1937, owing to lack of Caribou (Manning, 1942:29). Buchanan (1920:216-217) records both "Timber Wolf" and "Barren-Ground Wolf" from the Reindeer Lake area and from east of Kasba ("White Partridge") Lake. Farther west, Preble and Seton (1911:351) present records from Artillery, Casba (=Ptarmigan), Aylmer, and Clinton-Colden lakes. Critchell-Bullock (1930:208-209) records Wolves from Artillery Lake and other points eastward to Chesterfield Inlet, including Sifton Lake and Dickson Canyon. Hornby (1934:108) mentions observations along the Hanbury and Thelon rivers. Degerbol (1935:20) records specimens from Southampton Island, Back River, and near Wager Inlet. Gavin (1945:229) writes of the species in the Perry River district. Anderson (1947:54) extends the range of *hudsonicus* as far west as the "region east of Great Slave Lake," intergradation with *C. l. occidentalis* taking place at Artillery and Ptarmigan lakes.

Alopex lagopus innuitus (Merriam)

CONTINENTAL ARCTIC FOX

No personal observations were made on this species, which provides the chief returns of the local trappers. Practically all my information

concerning it comes from Charles Schweder and Fred Schweder, Jr.

Apparently the breeding range of the Arctic Fox is roughly coextensive on the south with the Barren Grounds. Thus it occurs to some extent in summer in the Windy River area. It becomes commoner during some winters (presumably through migration from other parts of the Barren Grounds), but not in other winters. At this season some of the animals wander as far south as Reindeer Lake. Joe Highway, a Cree trapper, reported them as occurring sometimes about the south end of Nueltin Lake and at the neighboring Putahow Lake; the Chipewyan Indians of that area capture comparatively few.

Charles spoke as if Arctic Foxes were much on the move during the winter. In the season of 1946-47 he noticed three distinct "runs" passing through the area north or northwest of Nueltin Lake; the first occurred in November, the third in March (*cf.* Critchell-Bullock, 1930:211). Each of these movements was from east to west. On a single round of their traps in November the two brothers secured 70 Foxes, most of them being of the present species. About 30 others in the traps had been torn up or dragged away by Wolves. Such destruction of captured Foxes is a serious problem for the trappers.

During the winter the animals generally travel singly, but sometimes two together—not more. They are said to make their dens in sand ridges or eskers. Once Charles saw four young ones playing about the mouth of a den in September. While their tracks have been noted following those of Arctic Hares, there is no local knowledge of the capture of the latter animals by Arctic Foxes. Charles has had only once or twice the experience of hearing one of these Foxes bark in the open. But they seem to bark commonly when approached after being trapped. The white winter coat begins to appear in September, it is said, and lasts at least till the middle of May.

In the latter part of September, 1947, Fred saw an Arctic Fox 30 miles north of Windy River. When the trapping season commenced in November, exceedingly few tracks were to be found on the Barrens lying between the Windy and the Kazan rivers. This state of affairs may have been correlated with a scarcity of Lemmings in 1947. On a five-day trip south in late November to the vicinity of Putahow River, Fred reported finding no tracks of this species. By the following March the two brothers had secured only 20 specimens; but during the winter of 1948-49 the animals were again plentiful (Charles Schweder, *in litt.*, March 15, 1948, and May 16, 1949).

Preble (1902:62) records the Arctic Fox from northern Keewatin south (in winter) to Norway House and Oxford House, Manitoba, and Severn River,

Ontario. In the Mackenzie Basin it has been found in winter as far south as Peace River, Fort Smith, and the region tributary to Fond du Lac on Lake Athabaska (Preble, 1908:217-219). Preble and Seton (1911:353-354) provide an August record from Aylmer Lake and winter reports from Chipewyan, Fond du Lac, and Cree Lake. Buchanan (1920:218) mentions winter skins from east of Kasba Lake and at Reindeer Lake. Critchell-Bullock (1930:210) reports about a thousand trapped in the vicinity of Artillery Lake in 1924-25, and mentions the occurrence of the species at Aberdeen Lake. Hornby (1934:108) provides records from Casba River, Smart Lake, and Thelon River. Localities mentioned by Degerbol (1935:32) include Southampton Island, Repulse Bay, Boothia Isthmus, and Roe's Welcome; by Freuchen (1935:123), Chesterfield Inlet, an area west of Eskimo Point, and an island off Wager Inlet; by Manning (1943:104), Melville Peninsula and Cape Fullerton. Clarke (1940:35) reports the species as occurring throughout the Barrens, with records from Hanbury Portage and Plover, Prairie, Artillery, Eileen, Ptarmigan, and Schultz lakes. In the Perry River district its numbers vary with those of the Lemming (Gavin, 1945:229). Banfield (1951:114) adds records from Contwoyto and Clinton-Colden lakes and upper Back and Hanbury rivers; Gunderson, Breckenridge, and Jarosz (1955:256) record the species from the lower Back River.

Vulpes fulva ?regalis Merriam
NORTHERN PLAINS? RED FOX

In the absence of specimens it is impossible to allocate the local Red Foxes to a definite subspecies. Anderson (1947:48-49) does not seem to account for any form in Keewatin. Most of my information comes from Charles Schweder and Fred Schweder, Jr.

The occurrence and frequency of the Red Fox (in its various color phases) apparently depends to a considerable extent on the presence of timber tracts. Thus it appars rather common along the Windy and the upper Kazan Rivers, there being considerable spruce and tamarack growth in both areas. Along the Little Dubawnt River there is a smaller amount of timber and a smaller number of Red Foxes. In the Barren Grounds between the Windy and the Kazan rivers this species is very largely replaced by the Arctic Fox.

The several color phases (Red, Cross, and Silver or Black) occur in different proportions. The Silvers are scarcest, forming perhaps from 2 to 5 per cent of those trapped; they are mostly black, with a white-tipped tail and a few white hairs on the body. The Reds are the commonest, outnumbering the Cross Foxes by perhaps 2, 3, or 4 to 1. There is some local variation in these proportions. The total numbers also vary considerably from year to year. They were plentiful in 1946-47, but scarce a year previously and again during the winter of 1948-49. Possibly migration in years of rodent scarcity accounts for temporary decrease in their numbers.

During the early part of winter they are said to usually travel singly; but after the breeding season starts in February, they travel by pairs.

Like the Wolf, the Red Fox prefers to den in sandy country. Thus the fox-trapper plies his trade along the sandy eskers. Once in July, at a point some 40 miles northeast of the Windy River post, Charles Schweder saw two young ones playing about the mouth of a den. He reports finding bones of the following food species about various dens: Arctic Hare, Caribou, duck, ptarmigan, and fishes (mostly Pike). The last item presumably represents individuals that had been picked up dead.

According to Charles, the Wolves treat trapped Red Foxes as they do Arctic Foxes—pulling them out of the traps, tearing them up, playing with them, but not eating them.

A strange incident, observed by Charles and involving a Red Fox and a small buck Caribou, has been reported elsewhere (Harper, 1955:63).

Incidentally, Charles had never seen a Fox trying to catch any prey.

Fred Schweder, Jr., says that a Fox gives the same kind of bark when approached in a trap as when it is free.

Until snow came in the fall, I found no evidence of Foxes in the vicinity of camp. During much of October the ground was bare, but on the 8th, in 6 inches of snow, a track appeared near Windy River. On November 4 Fred Schweder, Jr., saw a Cross Fox at a point 5 miles northwest of camp. During the latter part of November tracks were fairly numerous both on the land and on the ice of the river. At several places two or three sets of tracks came together. Some of the footprints were about 3½ inches long. One of the animals had dug into the snow on a ridge, as if for a mouse; another had been attracted to a caribou carcass. A fine, fluffy-furred male specimen was trapped about November 26 by Fred along Windy River 2 miles above its mouth. During the earlier part of the month he had not trapped a Fox, whereas in the previous winter he had obtained 48 Red Foxes and 24 Cross Foxes.

Preble (1902:62) records the Red Fox from Oxford House, Cross Lake, Split Lake, and Churchill, Manitoba. J. A. Allen (1910:11) lists a skull from Fort Reliance, Great Slave Lake. Buchanan (1920:217-218) has various records from the Reindeer Lake region. Critchell-Bullock (1930:210) mentions specimens from Artillery Lake and the east end of Great Slave Lake; also tracks (probably of this species) on the Thelon River. I have records (1932:24) from the Tazin and Taltson Rivers. There are even reports from Southampton Island (Sutton and Hamilton, 1932:24) and from Cape Fullerton (Manning, 1943:104). Clarke states (1940:35) that the species wanders far out on the Barrens and that a few skins are traded at Baker Lake. Gavin (1945:228) records it as not common, but

regular, in the Perry River district. Banfield (1951:114) reports it as increasing on the tundra, with occurrences at Bathurst Inlet and Muskox and Contwoyto lakes.

Euarctos americanus americanus (Pallas)

American Black Bear

Local records

The Windy River area constitutes a northern outpost in the range of the Black Bear. Although considered a forest animal, it here ranges freely over a terrain consisting predominantly of Barren Grounds. It was apparently unknown locally until June, 1944; in that year Charles Schweder secured three, and his brother Fred, one. In the same season another was shot by an Eskimo, Pamala, along the Kazan River about 20 miles east of the north end of Ennadai Lake; and a female with a cub was seen by another Eskimo about 18 miles northwest of the mouth of Windy River. These last are among the northernmost records of the species in Keewatin; its occurrence in Eskimo country is evidently unusual. In October, 1944, when 90 Caribou had been killed on two successive days during a big movement in the vicinity of the Windy River post, Bears destroyed 70 of the carcasses, and remained abroad till nearly November.

In 1945 a Black Bear was obtained by Charles Schweder in September, and one in the brown pelage by Fred Schweder, Jr., in October. The latter is said to have differed from the others in no respect save color. In April, 1946, Charles shot a Bear between Nueltin and Duck lakes; in the same year one or more of the animals consumed half a dozen caribou bodies in the vicinity of Four-hill Creek, a tributary of Windy River. Along this creek is one of the largest spruce tracts within a long distance; it probably covers several square miles (Harper, 1953:7, fig 5). It furnishes so much better cover than the adjacent Barrens that the local Bears apparently utilize it as their headquarters and place of refuge.

In 1947 depredations by Bears on caribou carcasses in the Windy River area became serious again. On September 17 Fred Schweder, Jr., found nine carcasses consumed a few miles northwest of camp, where the animals had been left when killed about 10 days previously. The manner in which they had been torn apart and demolished indicated the work of Bears rather than of lesser animals, such as Wolves or Foxes. Three days later six more carcasses had been treated likewise in that vicinity. On September 30 several such bodies were found along Little River within half a mile of our camp. By November Charles Schweder estimated that some 40 caribou bodies had been lost to the Bears. During preceding weeks he and Fred had made several trips before daybreak

or on moonlight evenings to keep a vigil for the marauders about Four-hill Creek, but without success. Since no signs of Bears are ordinarily found on the north side of Windy River for a distance of more than 10 miles out in the Barrens, the residents were making plans in October to go north some 20 miles and there kill enough Caribou for their winter needs.

Black Bears are still more numerous about the south end of Nueltin Lake. Sometimes, according to Charles, the local Chipewyans lose so many of their caribou kills to the Bears that they go hungry. These Indians do not hesitate to tackle the animals, and they endeavor to kill every one they encounter, for food. They secure some every year, but not enough to thin their numbers. In late October three of these Chipewyans, visiting the Windy River post, reported that they had lost a good many of their caribou carcasses to the Bears, but had killed two of the latter. On a certain June day Charles himself had seen eight Bears about the south end of the lake. On a trip to that area about the middle of May, 1947, Fred Schweder, Jr., saw the tracks of 17 Bears.

Charles Schweder had an interesting theory to account for the recent spread of Black Bears from the south end of the lake (where presumably they have always been) to the north end. Evidently the animals have long been accustomed to fattening up in the fall on the Caribou killed by the Chipewyans in the former area, and thus getting into prime condition for hibernation. But a recent decline in the local Indian population has resulted in a smaller kill of Caribou. Consequently some of the Bears have shifted their quarters to the Windy River area, where they find good shelter in the spruce tract along Four-hill Creek and plenty of fall-killed Caribou in the adjacent Barrens.

In June I came upon the skeleton of a Black Bear on the Barrens a mile northwest of the Windy River post, and I secured the skull as a specimen. The animal had been shot by Charles Schweder in August, 1944, as it was feeding on one of his caribou carcasses. Later Charles brought me the skull of another Bear that he had killed on August 7, 1944, in spruce timber along Four-hill Creek.

Coloration and measurements

Late in the afternoon of October 2 I was returning from a visit to the fish camp on Windy River just above the mouth of Four-hill Creek, when a fusillade of shots began to ring out in the spruce timber. I recrossed the creek, and presently encountered Charles, who reported having just killed a 400-pound Bear. He had heard it moving about in the thick "bush," and the Bear had heard him. It had required about

eight shots from a .30-.30 rifle at a distance of perhaps 50 yards to finish the animal. Several of the slugs had merely gone through the tough hide and were recovered in the skinning process (which was completed in deep dusk and moonlight, with the help of a bonfire). This animal, like the half-dozen others secured previously in the Windy River area, was a male. The general color is black; fur basally Bister; snout Mummy Brown above, changing to pale brownish on sides; nails fuscous, tips paler. The measurements were: length, 1750; tail, 120; foot, 265; ear, 130; height at shoulder, 1050; testes, 57×38 mm. A search revealed no ectoparasites on it. It had a rank odor. Rich feeding had given it a broad strip of back fat, up to 3½ inches in thickness; the weight of this strip was estimated at 70 pounds by Charles, who stated that it was the fattest Bear he had ever killed. In addition, much fat was obtained from the abdominal cavity. The fat was to be tried out and used for lard; it is said to be especially good for pie-making.

The height at the shoulder in this specimen (1050 mm. or 41⅓ in.) may be compared with the same measurement as recorded by others for various subspecies of *Euarctos americanus*: 37 in. (Audubon and Bachman, 1849, 3:188); 25 in. (Anthony, 1928:75); slightly more than 2 feet (Hamilton, 1943:114); 2 to 3 feet (Burt, 1946:121); 25 to 40 inches (Cahalane, 1947:143); 27 to 36 in. (Palmer, 1954:79). Among the maximum dimensions given by Grinnell, Dixon, and Linsdale (1937, 1:102-103) for California or Alaska Black Bears are the following: length, 70 in. (1777 mm.); height at shoulder, 36 in. (914 mm.); foot, 10½ in. (267 mm.). In November, 1955, I estimated the shoulder height of a good-sized animal in the National Zoo at 31-32 inches. Fred Ulmer gives me 35 inches as the closely approximate height in a seven-year-old male from the Poconos in the Philadelphia Zoo; it had been raised in captivity from its cub days. A height of less than 30 inches for a full-grown male hardly seems reasonable. There is evidently a scarcity of measurements by field zoologists.

On October 18 Charles found tracks of at least two Bears on the north side of Windy River several miles above Four-hill Creek. Joe Highway, a Cree trapper, reported considerable numbers of the species at Putahow Lake, on the Keewatin-Manitoba boundary west of Nueltin Lake.

Unlimited quantities of edible berries—particularly crowberries, mountain cranberries, and blueberries—are available for the Bears of the Nueltin Lake region.

Distribution

Preble (1902:64) records the Black Bear in Manitoba north to Robinson Portage, Oxford Lake, Steel River, and Churchill River about 100 miles from its mouth. Buchanan (1920:218) reports "Black Bear" and "Brown Bear" along the Churchill River in Saskatchewan. I have presented records (1932:22) from the Tazin and Taltson rivers. Clarke suggests (1940:32) that reports by Hanbury

(1904:14) from the Thelon River and by Freuchen (1935:101) from the vicinity of Baker Lake and Eskimo Point pertain actually to the Barren Ground Grizzly rather than to the Black Bear; at the same time (pp. 30, 32) he presents records from the east end of Great Slave Lake and from the Padlei district. Anderson (1947:36) limits the northward range of *E. a. americanus* in the Athabaska-Mackenzie region to the "southern part of Northwest Territories"; he replaces it from the Liard River northward with *E. hunteri.*

Ursus andersoni Merriam
ANDERSON'S GRIZZLY

Anderson indicates (1947:43) that this species (type locality: east branch of Dease River, near Great Bear Lake) may range as far east as the upper waters of the Kazan River. However, inquiry in 1947 elicited no definite information concerning the occurrence of any form of Barren Ground Grizzly about Nueltin Lake or the upper Kazan River.

Grizzlies of the western Canadian Barren Grounds, whether belonging to one or to several forms, seem to be largely restricted to the range of *Spermophilus undulatus parryii*, which, with its underground stores, may play an important role in the economy of these big animals.

Thalarctos maritimus maritimus (Phipps)
POLAR BEAR

The following notes were obtained from John Ingebrigtsen. In 1945 a Polar Bear came swimming up the Churchill River at Churchill and was shot. Another was shot near the local airport about January, 1946. In the spring, about 1941 or 1942, an Indian captured a little one, about 12 inches high, in the "bush," probably between Churchill and Cape Churchill. It was shipped to the Winnipeg Zoo. There was also some account of a Polar Bear being captured or fenced in at the huge grain elevator in Churchill, but I did not learn the details.

According to Preble (1902:65), "Polar bears occur regularly all along the coast of Keewatin [including the present Manitoba] as far south at least as Severn River [Ontario]." Gavin (1945:228) refers to them as sometimes common on the ice and shores of Queen Maud Sea.

Martes americana abieticola (Preble)
HUDSON BAY MARTEN

Fred Schweder, Sr., of Churchill, informed me that a quarter of a century previously 500-600 Martens were traded (annually) at Reindeer Lake. He used to see bales of their skins being transported by dogteam at the south end of that lake. The "bush" about Kasba and Ennadai

lakes used to be good marten country. The Chipewyans about the south end of Nueltin Lake got a few in former years. Long ago there were said to be a few in the patches of timber about the north end of Nueltin Lake, but they were trapped out. None is known to have occurred in that immediate vicinity in recent years. Charles Schweder corroborates this statement.

However, in September, 1947, Fred Schweder, Jr., found a Marten on the Barren Grounds a dozen miles north of Windy River. It was not in a trap, and it had been dead for a year or so. The skeleton and some of the fur remained. Joe Highway reported a few of the animals about Putahow Lake, on the Keewatin-Manitoba boundary.

In describing the present subspecies (type locality, Cumberland House, Saskatchewan), Preble (1902:68) gave its range as extending "throughout the region north to the tree limit," with definite records from Norway House, Oxford House, Cross Lake, York Factory, and Churchill. Hearne (1795:21) mentions the animal in the vicinity of Seal River. Buchanan (1920:219) records it from Theitaga (Kasmere) Lake and from north of Du Brochet Lake. Clarke (1940:33) presents reports (subspecies not specified) from Reliance, Snowdrift, Thelon River, and Yathkyed Lake. Anderson (1947:58) gives the distribution of *abieticola* as "wooded parts of northern Manitoba, Saskatchewan, and Alberta." Southern Keewatin may be added to this range.

The Fisher *(Martes pennanti)* seems never to have been recorded in the Nueltin Lake area.

Mustela erminea richardsonii Bonaparte

RICHARDSON'S ERMINE; RICHARDSON'S WEASEL

Numbers

Weasels evidently occur throughout the Nueltin Lake area. Charles Schweder reports them as far as his trap-line extends—along the Little Dubawnt River, south of Dubawnt Lake. They are found, he said, out in the Barrens as well as in the timber; on top of the highest hills, among rocks, in grassy areas, and among willows along river banks. He has seen a Weasel in thick spruce growth, jumping from tree to tree at a height of about 4 feet above the ground. During the winter of 1946-47 they were common on the Little Dubawnt, frequently appearing about camps and becoming rather tame. Mice were common at the same time. Charles secured 21 specimens during the winter of 1946-47; 10 of these were on the Little Dubawnt, the rest along the Kazan and Windy rivers. The bigger hides fetched as much as $4.50. He has seen the animals stirring abroad both by day and by night. He expected the

Weasels to be rather scarce in the winter of 1947-48, their cycles of frequency apparently corresponding (to a certain extent) to those of the Arctic Foxes. For the winter of 1948-49 he reported (*in litt.*, May 16, 1949) Weasels as "so scarce you would not see any tracks in weeks."

Food

Fish heads are regarded as one of the best baits for Weasels. More than once Charles has caught them in traps inside caribou carcasses. He has noticed their tracks going down into the subterranean burrows of Red Squirrels. He has seen the animals carrying mice in their mouths.

Nests

The only nest of young that had come to his notice was found in July of a previous year beneath the floor of the abandoned trading post (Simons' House) at Simons' Lake. It was apparently revealed by the sound of the voices of both the old and the young ones. The adult then started to remove the youngsters, one at a time, to a storehouse at a distance of about 50 yards. There were at least four in the litter. After a time they were moved again to some unknown location. On another occasion he found that a weasel had brought some caribou hair inside a carcass to make a nest of it; this was on the south side of Windy River.

Charles has caught Weasels in October that had assumed the white winter pelage. When cornered in a trap, one will make a hissing noise.

Measurements and coloration

On September 29, when the ground was bare, although there had been a little snow at intervals for several weeks, Mike Schweder trapped an adult female (fig. 8; pl. 5, fig. 2) in the brown summer pelage in a spruce muskeg near the mouth of Windy River. The trap was baited with a piece of Whitefish. The whitish rim to the ears was a conspicuous mark. The soles of the feet were so fully furred that the toe pads were nearly hidden. Externally there seemed to be a slight indication of the forthcoming change to the white winter pelage; yet the hide was entirely prime. There was a rather uniformly thick layer of fatty tissue on the inside of the skin. The uterus was small. The animal's measurements were: length, 280; tail, 74; foot, 37; ear, 12.5 mm.; weight, 129.5 grams. Three mites, each of a different species (*Haemogamasus alaskensis* Ewing, *Laelaps alaskensis* Grant, and Listrophoridae (hypopial stage)), were collected from it.

In this specimen the upper parts, including the basal half of the upper side of the tail and the upper portions of the limbs, are near Snuff Brown, with basal fur grayish white; narrow upper margin of ears

grayish white; distal half of tail black on both surfaces; median basal half of under side of tail Pale Olive-Buff; underparts of body (including upper lip as far as nostrils), a spot at the posterior border of the eye, and upper surface of hands and toes, whitish, with a pale yellowish cast. This color description does not altogether harmonize with Hall's description (1951b:111-112) of *richardsonii*.

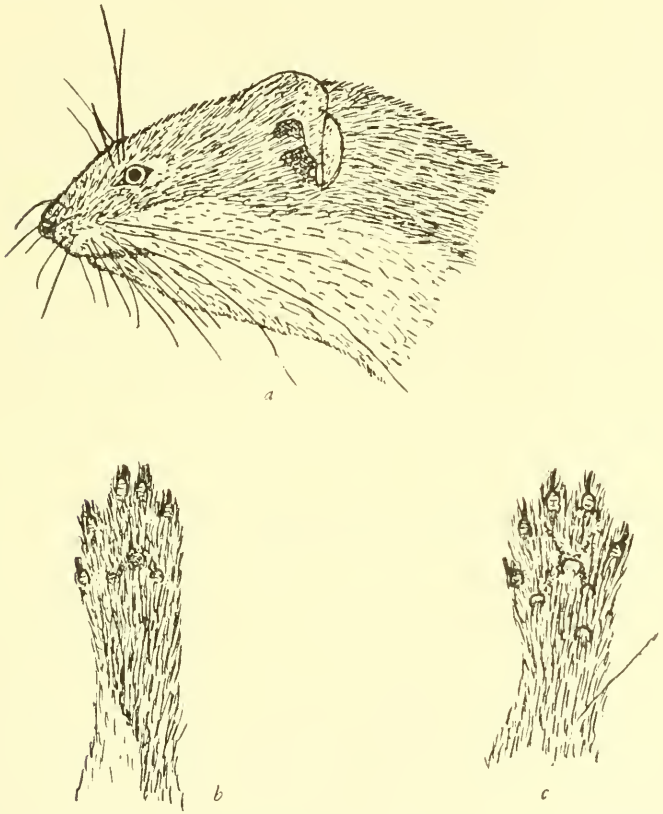

Fig. 8.—Richardson's Ermine, adult female (orig. no. 1110): (*a*) profile (×1); (*b*) sole of left hind foot (×1); (*c*) sole of left forefoot (×1). Windy River, September 29, 1947

Habitats

It was only after the snow came in the fall that we could gain any adequate idea of the numbers of Weasels about Windy River. The tracks were then noted at intervals from September 21 to November 30, but they were not common. They appeared in spruce timber, on the bare ridges of the Barrens, and on the frozen surface of a tundra pond,

where the prints were only about 5 inches apart; also in two log huts at camp, in one of which some caribou fat was stored.

On a five-day trip in late November to the vicinity of Putahow River, Fred Schweder, Jr., noted a single weasel track. Joe Highway reported the species about the south end of Nueltin Lake, at Putahow Lake, and at an unnamed small lake to the west, on the Keewatin-Manitoba boundary.

Distribution

Preble (1902:67) records *M. e. richardsonii* from Churchill River a few miles above Churchill and from the Barren Grounds below Hubbart Point, Manitoba; he mentions (1908:231) specimens far to the westward at Lake Athabaska and Great Slave Lake. Buchanan (1920:218) records specimens from Reindeer Lake and Cochrane River. Anderson indicates (1947:63) that the meeting-ground between *richardsonii* and *semplei* is on the west coast of Hudson Bay at about latitude 60°. J. A. Allen (1910:11) and Preble and Seton (1911:356) refer to the subspecies *arctica* a specimen from Clinton-Colden Lake. Some of the nearest localities from which Hall (1951b:117-118) lists specimens of *richardsonii*, are Baker Lake (Keewatin), Fort Rae and Fort Resolution (Mackenzie), Poplar Point and Fair Point (Lake Athabaska), and Churchill; the nearest of these (Churchill) is about 250 miles distant.

The local trappers evidently have no knowledge of the Least Weasel *(Mustela rixosa)*.

Mustela vison lacustris (Preble)

HUDSON BAY MINK

This hardy Mink not only occurs throughout the forested region between Hudson Bay and Athabaska and Great Slave lakes, but it also ventures northward into country consisting predominantly of Barren Grounds. Although it is not common along Windy River, Fred Schweder, Jr., secured six there in one season. Along the Little River, a dozen miles above its mouth, Charles Schweder once trapped a Mink beside a caribou carcass; it had been going inside the carcass to feed. In a certain January, when the waters were frozen over, he saw a Mink in the country east of Ennadai Lake and about 15 miles south of the Kazan River. When he turned a dog loose to chase it, it climbed a tamarack about 15 feet to its top, where it was shot. Charles has also secured Mink along the Kazan River close to Ennadai Lake. During the winter of 1946-47 he obtained a specimen on the Little Dubawnt River, a southerly tributary of Dubawnt Lake; this stream is swift and remains open through the winter.

In the Windy River area there was little evidence of Mink until the snow came in the fall. Then their tracks appeared at various places

along the lower course of the river. On October 28, at the fish camp 2 miles above the river's mouth, I noted one or two half-eaten fish in one of the gill-nets, and a portion of a fish lying on the bottom near by. This was presumably the work of a big Mink, which had left tracks and a furrow in several inches of snow on the river's bank. Charles reported similar depredations in former years at nets that had been set in the river above Simons' Lake. Fred Schweder, Jr., saw a Mink at the upper end of this lake on October 14.

In late November, on a five-day trip to the vicinity of Putahow River, Fred saw a good many mink tracks in places where there was open water. At that time there was a distinct scarcity of Arctic Foxes on the Barrens to the north; consequently Fred was turning his attention to Mink in the country extending from Windy River southward. By the following March he had secured 10 specimens.

Measurements and coloration

On October 17 Fred trapped an adult male of about average size on the bank of Windy River at the Crooked Rapid, a mile above the mouth. Its measurements were: length, 560 (approximate); tail, 185; foot, 60; ear, 15; testes, 9×5.5 mm. (descended); weight, when the fur was saturated, 2¾ lb. It was distinctly fat; the stomach was empty. The hide was unprime except for a small spot on the throat and one on the chest. The general color above is near Vandyke Brown, changing insensibly into a slightly paler color below and into Light Seal Brown on tail (above and below); chin, half a dozen spots of irregular size and arrangement on throat and upper breast, and several small spots in inguinal region, white.

Food

The Mink are said to feed on Ptarmigan occasionally, in addition to fish. There are apparently no crawfish available in the Nueltin Lake area. According to Charles, one of the best things with which to lure a Mink to a trap is the body of another Mink; its object is apparently not to eat, but merely to investigate, the carcass. When the residents' winter supply of Whitefish is left on the bank of Windy River, Mink will sometimes come and feed upon them. When the water level drops during the winter, air spaces are left beneath the ice at the edges of lakes, and here the Mink and the Otter gain access to the water. They also find similar places at the rapids on the rivers.

On December 1 Fred brought to camp a 13-inch Burbot or "Moray" *(Lota maculosa)* that had been left by a Mink on the ice at the edge of the open water of Crooked Rapid on Windy River. He had noticed

the same sort of thing here on two occasions in previous winters. Evidently the Mink does not relish this slimy species sufficiently to eat it after capture. The fish that it does eat are generally dragged over the ice to a hole among rocks on the shore. Judging by the marks left on the snow-covered ice, Fred thinks that the fish captured are generally not much larger than the above-mentioned "Moray."

Distribution

Charles Schweder spoke of a trapper who had secured 175 Mink in one season, and perhaps 200 in another season, in the Wollaston Lake area. He also reported this species as part of the fur catch of the Chipewyans about the south end of Nueltin Lake.

Preble (1902:66) records the present subspecies from the Echimamish River near Painted Stone (type locality), Oxford House, Swampy Lake, and Churchill River, Manitoba. Buchanan (1920:218) reports it from the country between Kasba and Nueltin lakes. I have recorded (1932:23) a specimen from the Tazin River, Mackenzie. Clarke (1940:35) mentions the occurrence of the Mink on Back River and Ptarmigan River. Anderson (1947:67) includes in its range the "wooded parts of Keewatin district and Mackenzie district to Great Slave Lake."

Gulo luscus luscus (Linnaeus)

HUDSON BAY WOLVERINE

Numbers and local range

According to Charles Schweder, the Wolverine occurs practically throughout the region he is familiar with, between Dubawnt and Reindeer Lakes. He considers its numbers approximately equal on the Barrens and in the wooded country, but it is nowhere common. He is not aware that specimens from the two types of country differ in size or color. He meets with them on the Barrens, where practically all his trapping is done. In most winters he secures one or none; never more than three. He usually sees from one to three in the open per year. When detected, they run away around a hill and so escape, leaving no track on the hard snow. He does not think he could run one down in an open chase, though he might be able to overtake one on a lake with his dogteam. He has had to give up pursuit when the terrain became too rough. He may secure two or three skins per year from the Eskimos of the upper Kazan River; some of these natives may go as far as 30 miles from their camp to trap, but most of them only about 10 miles. During the winter of 1946-47 he secured three specimens in his own traps, two of them within 30 miles of Dubawnt Lake. He reported "lots" during the winter of 1947-48, and "quite a few" during the following winter.

Charles believes a Wolverine has a more limited range than a Wolf

or a Fox. Fred Schweder, Jr., says that one will travel as far as 10 miles from its den. He has followed for a distance of 3 or 4 miles the tracks of one that had made off with a trapped Arctic Fox. The Wolverine commonly carries off such trapped animals; apparently it does not kill them in the trap, but waits until they are dead. Sometimes it buries the Fox; sometimes it takes it into a den. Fred has found no actual evidence of the Fox being eaten, though a whole leg and shoulder may be torn off while it is being removed from a trap. He gave up a trap-line extending west of Simons' Lake because of the number of troublesome Wolverines in that area. Charles has twice recovered a Fox that had been taken away and buried. Wolverines will also drag away the meat of a Caribou that has been killed by either man or Wolf. On September 7 Fred shot a doe Caribou within a few miles of camp; three days later he found that some animal (probably a Wolverine) had gnawed off the head and neck and made off with these parts. Charles is inclined to think that the species does not capture much live food.

Fred knew of six Wolverines inhabiting the territory along the line of his travels between the Windy and the Kazan rivers. On September 29 he saw one of them about midway between the two rivers. On October 11 he reported tracks in the snow 2½ miles northwest of our camp. On October 15 I noted tracks on a sandy beach at Simons' Lake; the identification was confirmed by Charles and Fred. About five weeks later Joe Highway reported that some caribou meat we had left in the near-by Simons' House was gone, and that Wolverine sign was all about the place. During the previous winter a Wolverine had visited the main camp on Windy River while everybody was absent.

Trapping

These animals are not readily held by a fox trap. If a trap is chained to a horn or a hind leg of a Caribou, the Wolverine may chew off either part and get away with the trap. In time it may become free of the trap through the loss of toes. Most of those finally captured are said to have two or three toes missing. Six individuals have escaped from (or with) Fred's traps. During the winter of 1946-47 Charles trapped a specimen in the rocky Windy Hills near the mouth of Windy River; in the following October he brought the skeleton to camp for my inspection. He says that the species growls "the same as a dog" when approached in a trap. It is considered too tough a customer to be handled with any instrument less powerful than a gun.

Dens

According to Charles, the Wolverines like to den among rocks. They go down among such big boulders that one sees no dirt thrown out

of a burrow. The location of the den is revealed by the caribou bones strewn about it. The only local information available about the young pertains to a half-grown individual seen along the Kazan River by Fred in September, 1946.

In recent years the hides seem to have generally fetched only $5 to $15 in the fur market; but occasionally as much as $22.

Distribution

Joe Chambers, a trapper of Goose Creek, 10 miles south of Churchill, spoke as if there were few Wolverines in his vicinity. According to Joe Highway, there are just a few about the south end of Nueltin Lake and at Putahow Lake.

Preble (1902:69) records the Wolverine "throughout the region between Lake Winnipeg and Hudson Bay"; also on Melville Peninsula and in the vicinity of Marble Island. Later (1908:239) he notes its occurrence at many localities in the Athabaska-Mackenzie region, including Great Slave, Great Bear, and Artillery lakes and Dease River. Preble and Seton (1911:253, 358) have records from Fond du Lac on Lake Athabaska, Fort Reliance, and Artillery Lake. Anderson (1913: 524) records it at Great Bear Lake and along the Arctic coast from Franklin Bay to Coronation Gulf and Victoria Island. Buchanan (1920:219) mentions seeing skins between Kasba and Nueltin lakes. Critchell-Bullock (1930:210) records the species from Ptarmigan ("Casba") River and Smart Lake (northeast of Artillery Lake). Sutton and Hamilton (1932:23) refer to its occurrence at Repulse Bay. Degerbøl (1935:35) reports it from Lyon Inlet and Back River; Freuchen (1935:97), from Frozen Strait, Roe's Welcome, Baker Lake, and near Eskimo Point; Clarke (1940:34), from the Thelon and Hanbury rivers and Lake Beechey; and Gavin (1945:228), from the Perry River district. According to Anderson (1947:69), its range extends from Ellesmere and Melville islands south into the United States. MacIver (1952) gives an illuminating account of the Wolverine, with records from Wholdaia and "Sylvan" (=Selwyn?) lakes.

Lutra canadensis preblei Goldman

MACKENZIE OTTER

The Otter seems to be somewhat sparingly distributed in southwestern Keewatin. It occurs in the Windy River area in fall and winter, but has not been noted in this river in summer, according to the observations of Fred Schweder, Jr. In July, 1945, he saw two on a little lake near Windy Bay. On October 28 of that year, when the ice extended out only a few feet from the river shore, six Otters, in two groups of three each, came swimming down the Windy River near its mouth, and Fred shot one of them. In January, 1945, he saw three of the animals (two together, one by itself) on the Kazan River at the outlet of Ennadai Lake, where the water never freezes. He had not succeeded in trapping any Otters. On November 25, 1947, he found much otter sign at the

Windy Rapid, 1½ miles above Simons' Lake. Charles Schweder saw one on October 14 in Windy River half a dozen miles above its mouth; he had shot about four altogether, up to 1948.

Fred once saw what he considered an Otter den at the Windy Rapid. It was about 20 feet from the river's edge, and above the water level. There were otter tracks going into it.

In mid-November Joe Highway shot an Otter (besides wounding another) on a small river about 15 miles west of Putahow Lake, and probably just below the Keewatin-Manitoba boundary. The skin, which I examined at the Windy River camp, was close to 5 feet in length. It was brown, with a pale grayish throat and chest; it was notably fat.

Fred Schweder, Jr., said that the Otter eats its captured fish on the edge of the ice, whereas the Mink drags its fish off to some hole. Thus the Raven gets some of its provender by picking up the Otter's leavings. At the Windy Rapid and at various places along the Windy River, Manitoba Whitefish *(Coregonus atikameg manitobensis)*, weighing 3 to 4 pounds, and Red Suckers *(Catostomus catostomus)* are the principal species preyed upon. Apparently a "Moray" *(Lota maculosa)* is also captured occasionally.

J. B. Tyrrell (1897:166) states that in the region to the eastward of Lake Athabaska the Otter occurs on all the streams throughout the wooded country. Preble (1902:65) presents records from Hill and Churchill rivers, Norway House, Oxford House, and Cross Lake, Manitoba. Later (1908:228) he reports finding the species more common between Fort Rae and Great Bear Lake than elsewhere in the Athabaska-Mackenzie region; he also mentions MacFarlane's records from the Lockhart and lower Anderson rivers. Buchanan (1920:218) reports the Otter at Reindeer Lake. I have recorded it (1932:24) on the Taltson River. Clarke (1940:35) mentions Baker Lake and the vicinity of Padlei as localities where the Otter has occurred far out on the Barrens. According to Anderson (1947:70), the present subspecies ranges from the Mackenzie Basin to Hudson Bay, and south to northern Manitoba.

Lynx canadensis canadensis (Schreber)
CANADA LYNX

Although the Lynx has been known to venture beyond the limit of trees to the Arctic coast, I secured only negative information concerning it in the Nueltin Lake area. Even at the south end of the lake, according to Charles Schweder, the Chipewyans apparently get none of these animals.

Preble (1902:61) reports the Lynx "throughout the region between Lake Winnipeg and Hudson Bay," with specific records from Island Lake, Cross Lake, Oxford House, and near Churchill. Some of the more easterly localities in the Athabaska-Mackenzie region where the animal has been recorded by Preble (1908:209), are: Slave River, Clearwater River, Isle à la Cross Lake, and

between the eastern end of Lake Athabaska and Churchill River. Seton (1911: 190-191) met with two individuals near the east end of Great Slave Lake. In the Reindeer Lake area Buchanan (1920:216) found evidence in the form of tracks only at the south, in the vicinity of Reindeer River. I have mentioned (1932:26) a sight record at Tsalwor Lake, Saskatchewan. Sutton and Hamilton (1932:36) report isolated occurrences at Coats Island and in the region of Repulse Bay. Anderson remarks (1947:76): "Frequently wandering to the Arctic coast of Alaska . . . , Yukon, and Northwest Territories." There is significance in Preble's statement (1908:210): "Though this animal extends its range nearly to the limit of trees, its preference for the Canadian zone is decided."

Phoca vitulina Linnaeus (subsp.?)

SEAL OF THLEWIAZA RIVER

The occurrence of a freshwater seal in the vicinity of the outlet of Nueltin Lake was brought to attention by Downes (1943:209, map). I. H. Smith, of Churchill, who lived in the 1920's on the northwestern arm of Nueltin Lake, informed me that he had noted "sign" of seals on rocks in Sealhole Lake, an expansion of Thlewiaza River just below the outlet of Nueltin Lake. He said further that they occur all along this river farther downstream, including Edehon Lake.

Still more definite information was kindly supplied by W. E. Brown, district manager of the Hudson's Bay Company. In June, 1927 or 1928, he saw a couple of seals in the outlet of Nueltin Lake, running into Sealhole Lake. He saw also five or six others while he was descending the Thlewiaza River to Hudson Bay, which he reached in the first week of July. One was seen above Edehon Lake, and one below it, and another was shot in this lake. Mr. Brown's Eskimo companion, who took the skin, called it something like *Kossigir*. (*Cf.* J. W. Tyrrell's (1908:279) Eskimo word *Kaus-e-gea* for the Freshwater Seal *(i. e., Phoca vitulina)*; also, the Southampton Eskimo name of *Kashigiak* for the same species (Sutton and Hamilton, 1932:37) and the Port Harrison Eskimo name of *Kasigia* (Manning, 1947:83).) The specimen was rather heavy-bodied, almost as big as the Bearded Seal or Square-flipper *(Erignathus)*, or half as big again as a good-sized "Jar Seal" *(Phoca hispida)*. Its weight was estimated at about 150 pounds; its length, at about four feet. (The relative proportions of the three seals, as here reported, do not agree closely with the published literature.)

Mr. Brown's account strongly suggests that the seal of the Thlewiaza River is some form of the Harbor Seal *(Phoca vitulina)*. It probably remains permanently in this fresh water; if it retired to Hudson Bay for the winter, it would scarcely have reached the outlet of Nueltin Lake as early as June. There appears to be no real obstacle to a seal's progress,

during the season of open water, in the river between Nueltin Lake and Hudson Bay.

This seal is likely to prove analogous to, rather than identical with, the Ungava Freshwater Seal (*Phoca vitulina mellonae* Doutt).

John M. Bourassa reported, on the authority of Charles Russell, post manager of the Hudson's Bay Company at Eskimo Point, that there are seals at Padlei on the Maguse River. Presumably they closely resemble, or are identical with, those in the Thlewiaza.

"There has long been a story current concerning the seeing of a seal in the Cochrane river. This latter event was a single incident but made such an impression as to be a matter of remark by several people." (P. G. Downes, *in litt.*, April 15, 1952.)

Preble (1902:71) records *Phoca vitulina* from the Hayes River several miles above York Factory, the mouth of Churchill River, and 50 miles south of Eskimo Point. Freuchen states (1935:232) that it is found at Wager Inlet, Roe's Welcome, Whale Point, Chesterfield Inlet, Baker Lake, Eskimo Point, and Churchill, "where it often goes far up the fresh water."

Odocoileus hemionus hemionus (Rafinesque)
ROCKY MOUNTAIN MULE DEER

"Information was given in 1929 by Mr. T. Lamb that it has occupied areas . . . around Reindeer Lake in the last 15 years, and in 1937 it was learned that it had recently been discovered at the edge of timber, at Nueltin Lake" (Clarke, 1940:28). Anderson indicates (1947:175) that the northeastern limit of this species extends from the west end of Great Slave Lake to western Manitoba. Manning (1948:26) found droppings of *Odocoileus* sp. at Big Sand and Neck lakes, Manitoba.

Alces alces andersoni Peterson
NORTHWESTERN MOOSE

In Keewatin the Moose wanders occasionally, but not commonly, north to the approximate limit of trees, and even beyond that limit. Charles Schweder spoke of an antlered skull lying on the Kazan River 15 miles below Ennadai Lake; it looked as if it might have been there for 25-50 years. There is some timber along that part of the river. Fritz Apfeldoll reported to Charles that he had once shot a Moose in a patch of timber not far from Sealhole Lake, just below the outlet of Nueltin Lake.

Fred Schweder, Jr., has seen tracks on Nueltin Lake south of The Narrows, and one of the animals in 1946 on the Kasmere River 20 miles above its mouth. The Chipewyans about the south end of Nueltin seem to go farther south to get Moose. Joe Highway reported the species at

Putahow Lake and at a smaller lake 15 miles to the west; in the latter locality he had recently secured two of the animals. Joe Chambers, a trapper of Goose Creek, 10 miles south of Churchill, spoke of his area as a good one for Moose.

Thomas Lamb, of The Pas, informed me that the Indians in that vicinity practice moose-calling. He himself gave a very realistic exhibition of the art.

Preble (1902:43) reports the species at various localities between Lake Winnipeg and Hudson Bay, including Echimamish River, Robinson Portage, Oxford House (where formerly almost unknown), Steel River, Shamattawa River, and Split Lake. Some of the more easterly localities for Moose in the Athabaska-Mackenzie region, as listed by Preble (1908:130), are: Stone (the present Fond du Lac) River, Thelon River, and Dease River. Preble and Seton (1911:340) mention the eastern extremity of Great Slave Lake. Buchanan (1920:214) found the Moose about Reindeer Lake and Cochrane River. There are records from the Tazin and Taltson rivers (Harper, 1932:29). Localities mentioned by Anderson (1924:28) are Rae River and 40-50 miles southwest of the mouth of Chesterfield Inlet; by Clarke (1940:28), Artillery, Beverly, and Yathkyed lakes and near Eskimo Point; by Banfield (1951:119), Yellowknife and Lockhart rivers and the region between Eskimo Lakes and Liverpool Bay. Manning (1948:26) found signs only as far north as Big Sand Lake and Neck Lake, Manitoba. According to Peterson (1952:24, fig. 1), the northern limit of the range of *andersoni* extends from western Ontario to the Mackenzie Delta.

Rangifer arcticus arcticus (Richardson)
BARREN GROUND CARIBOU

This species migrates through the Nueltin Lake area, spring and fall. It generally appears in very considerable numbers, but its movements are so erratic that in some seasons comparatively few are seen locally. The northward migration ceases about July 1. The animals are then absent till the early part of August, when they begin drifting back from the north. The bulk of the Keewatin population passes the winter in the wooded region on the south, although a small proportion may spend this season on the Barrens about the Windy and Kazan rivers.

A comprehensive account of the Barren Ground Caribou of Keewatin has been published elsewhere (Harper, 1955).

Rangifer caribou sylvestris (Richardson)
WESTERN WOODLAND CARIBOU

The marked dearth of recent information concerning this Caribou in northern Manitoba and adjacent regions is ominous. It is most obviously a vanishing animal.

According to Charles Schweder, it is totally unknown about the

north end of Nueltin Lake. He has never heard of any being secured by the Chipewyans about the south end of this lake. He has never seen any tracks on his summer trips to Reindeer Lake and return. In June, 1945, he did see a Caribou enter and swim across Sucker Lake, some 40 miles southwest of Nueltin Lake, but he distinguished no differences between it and the Barren Ground Caribou, and it may have been a belated individual of the latter species. He knew of a Woodland Caribou having been shot about 1925 near the Rabbit River Post, 40 miles south of Reindeer Lake.

Joe Highway, who has lived at Brochet on Reindeer Lake as well as at the south end of Nueltin Lake, reported that no Woodland Caribou are left in either area, although they are said by the local Chipewyans to have occurred in the latter locality a long time ago.

Half a century ago Preble (1902:40) could report the species "throughout the region . . . between Norway House and Hudson Bay"; one of the localities mentioned was Steel River. He also referred to its occurrence throughout the year on the Barrens between York Factory and Churchill. It is possible, however, that the animals then occurring on these Barrens were actually the Barren Ground species. Mr. G. W. Mahaher, director of the Manitoba Game and Fisheries Branch, informed me that numbers of the latter species now remain during the summer and breed on certain areas of Barrens between York Factory and Churchill. It is not at all likely that the Woodland Caribou could have survived there in appreciable numbers to the present day. I have discussed this question at more length elsewhere (1955:7-9).

As long ago as 1915 Buchanan (1920:214) was able to report only a few tracks of the present species in the vicinity of Pelican Narrows, south of the Churchill River. Joseph Bird, a well-informed man who had been stationed at a post on English River in western Ontario, 50 miles from Albany River, for some years up to 1918, informed me in 1920 that Woodland Caribou were so common thereabouts that one resident asserted it was easier to hunt them than Snowshoe Rabbits. In the same year J. A. Wilson gave me information concerning their recent occurrence at Lac la Ronge and Pelican Narrows, Saskatchewan, and at Athapapuskow and Kississing lakes, Manitoba. Anderson (1947:181) includes northern Manitoba and northern Saskatchewan in the range. Manning (1948), after investigating seven localities between Reindeer and Nueltin Lakes on the west and Hudson Bay on the east, does not even mention the Woodland Caribou.

In the Athabaska-Mackenzie region there seem to be extremely few records east of the Athabaska and Slave Rivers. According to R. MacFarlane (in Preble,

1908:136), the species occurs on both the northern and the southern shores of Lake Athabaska. In July, 1914, I saw fresh caribou tracks, probably of the woodland species, at Thainka Lake, northwestern Saskatchewan (1932:31). Ingstad (1933:11) killed four at Nonacho Lake. Banfield (1951:120) reports a small group of Caribou (presumably the Woodland species) on the northwest shore of Great Slave Lake in July, 1949.

Ovibos moschatus moschatus (Zimmermann)

BARREN GROUND MUSKOX

Although this species must have occurred in the Nueltin Lake area in former times, no definite information to that effect was obtained. It has long since retreated far to the northward of the type locality between the Seal and the Churchill rivers, Manitoba.

Charles Schweder spoke of an Eskimo report of two of the animals having been seen about 1944 at Angikuni Lake on the Kazan River, but he had no great faith in its credibility. He also said that Pamala (aged about 60 in 1947) was the only one of the Eskimos on the upper Kazan who remembered or talked about muskox hunts. These probably took place between the Dubawnt and the Thelon rivers, and probably about 30 years previously. There were said to have been "lots" of the animals. There seems to be a tradition that the Eskimos came all the way from Hudson Bay, via Padlei, to undertake these hunts.

Pamala, who is believed to have come originally from the Baker Lake area, told Charles Schweder how his people used to make bows of muskox horns, putting grease on them, holding them over a fire, and bending them until they became springy. They probably also thinned the horns down. Apparently two were used to make a bow. The Eskimos also used the horns for side pieces (not the points) of fish harpoons.

Preble (1902:43) summarizes previous records from the following localities: Barrens about halfway between York Factory and Churchill, and between Seal and Churchill rivers, Manitoba; northwest of Eskimo Point, near head of Chesterfield Inlet, between Wager and Back rivers, Repulse Bay, and Boothia Peninsula, Keewatin. (Records from Chesterfield Inlet northward presumably pertain to the somewhat doubtful subspecies *O. m. niphoecus*.) Clarke (1940:80) cites Hearne's old records from the region of Kazan River and Yathkyed Lake. More than a century after Hearne, J. B. Tyrrell remarks (1897:165): "The Eskimos on Kazan River reported that there were no musk oxen in their neighbourhood." Yet they were reported about Yathkyed Lake as late as 1929 (Anderson, in Hoare, 1930:49). MacFarlane (1905:686) mentions the trading of skins "from the inland Eskimo" at Reindeer Lake. As late as 1914 Buchanan (1920:215) saw skins near Kasba ("White Partridge") Lake that "had been taken by Eskimos in territory further north."

There are numerous old records in the Mackenzie District, some of the easternmost ones being from Aylmer, Clinton-Colden, Sussex, Sifton, Artillery, Musk-ox, and Dubawnt lakes, Bathurst Inlet, and Back, Hanbury, and Thelon

rivers (Preble, 1908:150; Preble and Seton, 1911:341; Hornby, 1934:107). According to Anderson (1947:183), the present subspecies is "now restricted to a few small isolated bands from upper Thelon and upper Back Rivers . . . ; scattered south of Bathurst Inlet, and a few in region north of Great Bear Lake." However, recent aerial surveys have disclosed some unexpected remnant bands (numbering apparently more than 200 individuals) south of Coronation Gulf between Tree River and Bathurst Inlet, on the headwaters of Burnside River, at Contwoyto, Aylmer, Clinton-Colden, and Wharton lakes, and on Simpson Peninsula (Banfield, 1951:121).

Additional Keewatin Mammals

Besides the 34 mammals discussed in the preceding accounts, 13 other terrestrial forms that have been recorded from Keewatin are listed below. Locality data and authorities for the records are included. Seven of the 13 forms are merely more boreal subspecies than those occurring in the Nueltin Lake region; and two others (*Lasiurus cinereus* and *Canis latrans*) represent accidental or exceptional occurrences.

Sorex cinereus ugyunak Anderson and Rand. Arctic Masked Shrew. ?Repulse Bay region; mouth of Back River (Sutton and Hamilton, 1932:9); Chesterfield Inlet and 40 miles southwest of Padlei (Anderson and Rand, 1945*b*:62).

Lasiurus cinereus (Palisot de Beauvois). Hoary Bat. One record, Southampton Island (Anderson, 1947:32).

Lepus arcticus labradorius Miller. Hudson Bay Arctic Hare. West side of Hudson Bay from Churchill north to Cape Fullerton and Southampton Island (Anderson, 1947:98).

Dicrostonyx groenlandicus groenlandicus (Traill). Greenland Varying Lemming. Southampton Island; Repulse Bay district; Baker Lake; Twin Lake (Sutton and Hamilton, 1932: 58; Manning, 1943: 104; Anderson and Rand, 1945*a*: 304; Anderson, 1947:148; Manning, 1948:25).

Dicrostonyx groenlandicus kilangmiutak Anderson and Rand. Mackenzie Varying Lemming. Anderson and Rand (1945*a*:305) extend the known range of this subspecies "east at least to Queen Maud Gulf"; and Hall and Cockrum (1953:482, fig. 129) extend it still farther east to Chantrey Inlet. On the other hand, Anderson (1947:148) seems to place the eastern limit on the mainland at Coronation Gulf. Determination of this limit must apparently await the acquisition of specimens from the Mackenzie-Keewatin borderland.

Clethrionomys rutilus dawsoni (Merriam). Dawson's Red-backed Mouse. Baker Lake (Clarke, 1940:38); Victory and Smoke Lakes (Manning, 1948:26); seemingly also Tavani (Sutton, 1931:155).

Microtus pennsylvanicus aphorodemus Preble. Barren Ground Vole; Keewatin Meadow Mouse. Near mouth of Thlewiaza River (Preble, 1902:52; Anderson, 1947:155).

Canis latrans Say subsp. Coyote. One record, inland from Eskimo Point (Clarke, 1940:35).

Canis lupus mackenzii Anderson. Mackenzie Tundra Wolf. Queen Maud Sea (Anderson, 1947:55).

Ursus richardsoni Swainson. Richardson's Grizzly. This species, whose main

range lies in northern Mackenzie, has been recorded by Clarke (1940:33) as far east as Beverly Lake, northwestern Keewatin. Whether this bear and *U. andersoni* (which has been mentioned on p. 64)) are actually distinct, is a question (*cf.* Rausch, 1953:105). Some form of Barren Ground Bear has been known from Cape Dobbs and from west of Wager Inlet (Manning, 1943:104); these are apparently the easternmost localities of record on the west side of Hudson Bay.

Mustela erminea arctica (Merriam). Western Arctic Ermine. Ogden Bay (Hall, 1951*b*:102).

Mustela erminea semplei Sutton and Hamilton. Eastern Arctic Ermine. Southampton Island; north of Wager Inlet; Cape Fullerton; Chesterfield Inlet; Tavani; Eskimo Point (Hall, 1951*b*:108).

Ovibos moschatus niphoecus Elliot. Hudson Bay Muskox. Once fairly common between Rae Isthmus and Daly Bay (Manning, 1943:103); Wager Inlet region (Anderson, 1947:183).

Although Hall and Cockrum (1953:435, fig. 45, and 477, fig. 126) plot the ranges of the Yellow-cheeked Vole *(Microtus xanthognathus)* and Smith's Bog Lemming *(Synaptomys borealis smithi)* as extending across southwestern Keewatin, there is evidently no actual record for either species in the district as yet. Likewise Hall (1951*b*:180, fig. 28) indicates the range of *Mustela rixosa rixosa* as including the southern half of Keewatin; but substantiating specimens apparently remain to be taken.

A Systematic List of Mammalian Ectoparasites, with Host Records, from Southwestern Keewatin, Canada

The present list is merely a summation, in different form, of the notes on ectoparasites that have appeared on preceding pages in the accounts of the various mammalian hosts. If there have been any previous reports on mites or sucking lice from Keewatin, they have escaped my notice. Two fleas (*Ceratophyllus tundrensis* and *Oropsylla alaskensis*) are reported by Holland (1949).

Among the 17 species of mites (Acarina) collected by the Canadian Arctic Expedition, 1913-18, principally along the coast of Mackenzie (Banks, 1919), not one was parasitic upon mammals. It is not surprising therefore, that the approximately equal number of mites in the present report are entirely different from those listed by Banks. Of the three sucking lice (Anoplura) of the same expedition (Ferris and Nuttall, 1919), two were of different species, and from different hosts, from those recorded herein. The fleas (Siphonaptera) of that expedition were lost before they were identified (Hewitt, 1919); the three mammalian hosts from which they had been obtained (*Lepus, Citellus,* and *Alopex*) were of different species from those providing the fleas listed in this

paper. Thus there is only a single species of ectoparasite *(Pediculus humanus)* common to the reports of the two expeditions. This is also the only mammalian ectoparasite included in the Report of the Fifth Thule Expedition 1921-24.

Realizing what interesting contributions might be made to our knowledge of the geographical distribution and the host relationships of these little creatures, I carefully searched for them in nearly every fresh mammal specimen that passed through my hands. These efforts were rewarded in the case of every species except the Black Bear, the Wolf, the Mink, and the Barren Ground Caribou. It may be worth remarking that I never observed the Husky dogs of our camp scratching for fleas, and that their owners had never observed fleas on them (*cf.* Weber, 1950:154).

The species of the present report number about 17 mites, 3 sucking lice, and 5 fleas, collected during a six-months period. By way of comparison, it may be mentioned that about 45 mites, 2 ticks, 2 biting lice (Mallophaga), 10 sucking lice, 13 fleas, and 1 beetle were found on mammals in northeastern Pennsylvania during less than four months of field work in 1945 and 1946 (Harper, MS). No ticks (superfamily Ixodoidea) and no chiggers (family Trombiculidae) were found in Keewatin. Apparently the ectoparasitic fauna becomes impoverished toward the Arctic.

The only species common to the present list and to a corresponding list from northeastern Pennsylvania (Harper, MS) are the following: *Haemogamasus alaskensis, Myocoptes musculinus, Hoplopleura acanthopus, Polyplax abscisa,* and *Peromyscopsylla catatina.* Both lists also include unidentified species of *Laelaps, Pygmephorus,* and *Listrophorus.* A considerable proportion of the species of Acarina and Anoplura in Keewatin were common to two, three, or four species of lemmings and mice (*Dicrostonyx, Clethrionomys, Phenacomys,* and *Microtus*). On the other hand, the Red Squirrel *(Tamiasciurus hudsonicus preblei)* shared only one mite *(Euhaemogamasus ambulans)* with any of these smaller rodents, and the flea *(Orchopeas caedens)* found on many of the squirrel specimens was not detected on any other host. The three kinds of mites collected from Richardson's Weasel *(Mustela erminea richardsonii)* were common also on the three mice on which it doubtless preys.

Although mites of the genus *Pygmephorus* are said not to be parasitic, I have found them to be common on small mammals in Pennsylvania as well as in Keewatin.

The local ectoparasites of widest host distribution were one (or more) undetermined species of Listrophoridae (on six hosts of two

different orders) and *Laelaps alaskensis* (on five hosts of two different orders).

Few of the species listed here were found on the ears of their hosts, although these appendages form a favorite point of attack in more southerly regions. Perhaps the severity of the climate discourages the ectoparasites from attempting to maintain a hold on such an exposed portion of the body. Most of them were well sheltered in the thick body fur.

For the determination of the species in the following list, I have been wholly dependent on the courteous and generous services of several specialists and collaborators of the Entomology Research Branch, United States Department of Agriculture. The groups of ectoparasites and those responsible for their determination are: Acarina—chiefly E W. Baker, also Hugh L. Keegan; Anoplura—E. W. Stafford; Siphonaptera —C. F. W. Muesebeck.

The sequence of species in Acarina is that of Baker and Wharton (1952); in Anoplura, that of Ferris (1951); and in Siphonaptera, that of Holland (1949).

Host records constituting additions to those supplied by Keegan (1951) for mites of the subfamily Haemogamasinae, by Ferris for the Anoplura, and by Holland for the Siphonaptera are indicated as follows: for the subspecies, by one asterisk; for the species, by two asterisks; and for the genus, by three asterisks. No compendium of host records for the North American Acarina as a whole seems to be available.

Order ACARINA (mites)

Family Haemogamasidae

Haemogamasus alaskensis Ewing:

**Clethrionomys gapperi athabascae* (June 19 and 20)

****Phenacomys ungava mackenzii* (August 21 and 22)

**Microtus pennsylvanicus drummondii* (August 29 to September 23)

****Mustela erminea richardsonii* (September 29)

Euhaemogamasus ambulans (Thorell):

**Tamiasciurus hudsonicus preblei* (September 5)

**Clethrionomys gapperi athabascae* (July 22 to October 4)

Family Dermanyssidae

Dermanyssinae, nymph:

Clethrionomys gapperi athabascae (July 25 to October 11)

Ichoronyssus sp.:

Dicrostonyx groenlandicus richardsoni (August 18)

Clethrionomys gapperi athabascae (August 17 to September 2)

Microtus pennsylvanicus drummondii (August 23 and 29)

Family Laelaptidae

Laelaps alaskensis Grant:

Dicrostonyx groenlandicus richardsoni (June 26)

Clethrionomys gapperi athabascae (October 4 to 26)
Phenacomys ungava mackenzii (June 23 to October 16)
Microtus pennsylvanicus drummondii (June 4 to November 15)
Mustela erminea richardsonii (September 29)

Laelaps kochi Oudemans:
Microtus pennsylvanicus drummondii (June 14 to November 15)

Laelaps sp.:
Ondatra zibethicus albus (October 15)

Haemolaelaps megaventralis (Strandtmann):
Clethrionomys gapperi athabascae (June 20)

Family Scutacaridae

Scutacarus sp.:
Clethrionomys gapperi athabascae (June 20)

Family Pyemotidae

Pygmephorus sp.:
Clethrionomys gapperi athabascae (September 14 to October 26)
Microtus pennsylvanicus drummondii (June 4)

Family Tydeidae

Tydeus sp.:
Clethrionomys gapperi athabascae (June 14 and 20)

Family Erythraeidae

Erythraeus sp.:
Clethrionomys gapperi athabascae (August 17)

Family Glycyphagidae

Glycyphagus cadaverum (Schrank):
Clethrionomys gapperi athabascae (September 24)

Glycyphagus sp.:
Clethrionomys gapperi athabascae (September 14)

Family Listrophoridae

Listrophoridae, hypopial stage:
Sorex cinereus cinereus (October 24)
Dicrostonyx groenlandicus richardsoni (June 26)
Clethrionomys gapperi athabascae (July 25 to October 26)
Phenacomys ungava mackenzii (June 19 to October 20)
Microtus pennsylvanicus drummondii (July 25 to November 5)
Mustela erminea richardsonii (September 29)

Listrophorus sp.:
Sorex cinereus cinereus (September 3)
Clethrionomys gapperi athabascae (June 14 to August 31)
Phenacomys ungava mackenzii (June 23 to September 4)
Microtus pennsylvanicus drummondii (June 4 to November 15)

Myocoptes musculinus (Koch):
Dicrostonyx groenlandicus richardsoni (August 18)
Clethrionomys gapperi athabascae (August 18 and 31)
Microtus pennsylvanicus drummondii (August 23 and 29)

Order ANOPLURA (sucking lice)

Family Hoplopleuridae

Hoplopleura acanthopus (Burmeister):
******Clethrionomys gapperi athabascae*** (June 20 to October 10)

***Microtus pennsylvanicus drummondii* (August 29 to November 15)

Polyplax abscisa Fahrenholz *cf.* Ferris, 1951:205, 211):

****Clethrionomys gapperi athabascae* (June 20 to August 17)

****Phenacomys ungava mackenzii* (August 21 to 23)

Family Pediculidae

Pediculus humanus humanus Linné:

Homo sapiens asiaticus—Eskimo (August 1)

Order SIPHONAPTERA (fleas)

Family Ceratophyllidae

Orchopeas caedens (Jordan):

Tamiasciurus hudsonicus preblei (August 27 to November 4)

Malaraeus penicilliger dissimilis Jordan:

****Clethrionomys gapperi athabascae* (September 24)

Megabothris asio (Baker):

Microtus pennsylvanicus drummondii (June 12 to September 6)

Megabothris quirini (Rothschild):

Clethrionomys gapperi athabascae (September 2)

Microtus pennsylvanicus drummondii (September 28)

Peromyscopsylla catatina (Jordan):

Microtus pennsylvanicus drummondii (August 29 to October 18)

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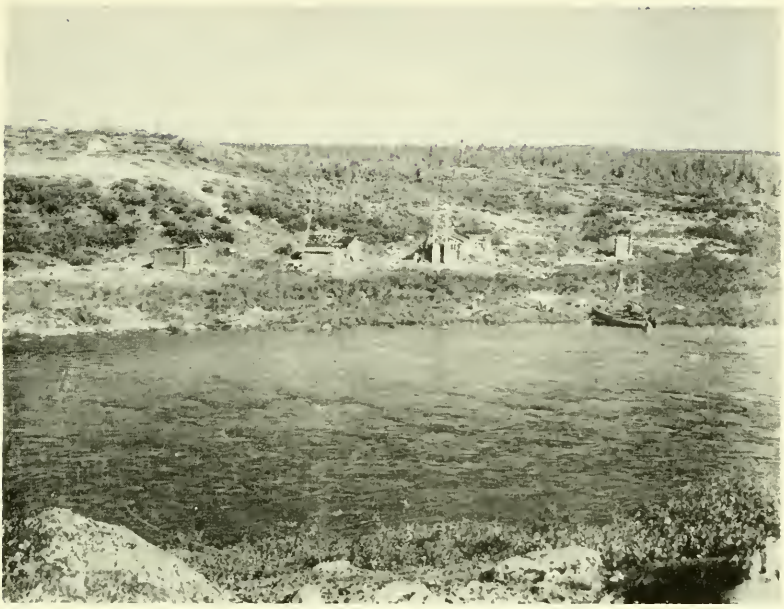

Fig. 1.—The Windy River post: a view northward from the south bank of the river. Dwarf birch on the slopes, and black spruce in the distance. August 12, 1947.

Fig. 2.—Camp on rocky Barrens at Josie's Bay. White spruce, dwarf birch, crowberry, alpine bearberry, bog bilberry, and narrow-leaved Labrador tea. July 12, 1947.

Fig. 1.—First Tundra Pond: a view eastward from Camp Ridge. Black spruce, tamarack, and dwarf birch. Long mid-day shadows of winter. November 16, 1947.

Fig. 2.—Mackenzie Red Squirrel, naked and blind nestling. Windy River post, July 24, 1947.

Fig. 1.—A dry, turfy mound in Bear Slough; habitat of *Dicrostonyx* and *Phenacomys*. Black spruce, dwarf birch, narrow-leaved Labrador tea, mountain cranberry, *Cladonia*, and moss. July 1, 1947.

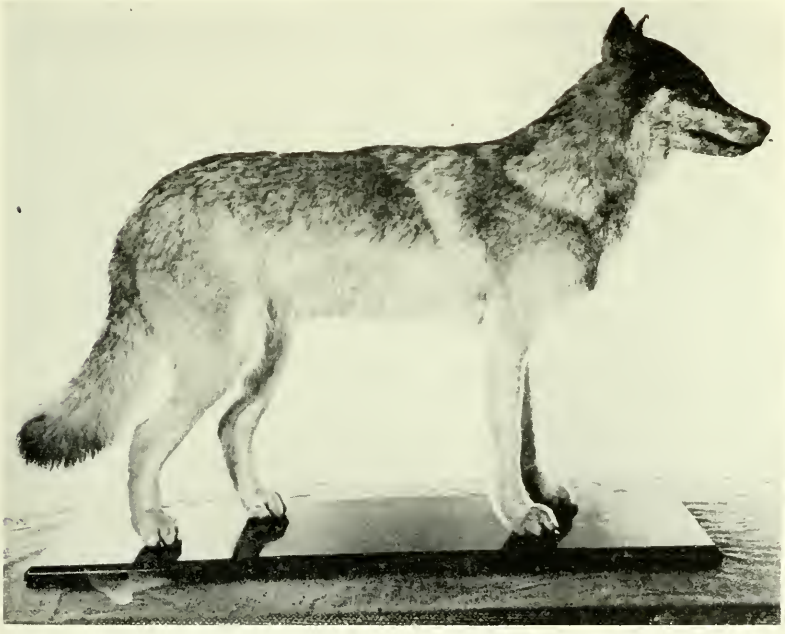

Fig. 2.—Keewatin Tundra Wolf: an adult male specimen (orig. no. 1094) in the Reading Public Museum and Art Gallery. Collected by Fred Schweder, Jr., near Windy River, September 6, 1947.

Fig. 1.—Keewatin Tundra Wolf: head of an adult male (orig. no. 1094) Windy River, September 7, 1947.

Fig. 2.—Two wolf dens on Wolf Esker, Windy Bay: one at base of two large spruces; other beneath snowbank at Charles Schweder's left. Extensive beds of dwarf birch in middle distance. June 12, 1947.

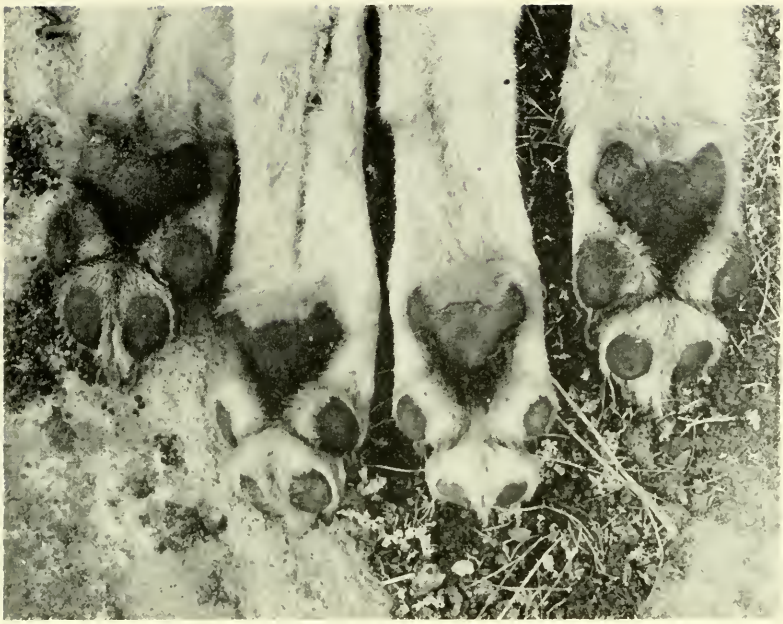

Fig. 1.—Soles of feet of Keewatin Tundra Wolf, adult male (orig. no. 1094); hind feet in middle. Windy River, September 8, 1947.

Fig. 2.—Richardson's Ermine, adult female (orig. no. 1110). Collected by Mike Schweder near Windy River post, September 29, 1947.

Fig 1.—A trapper of the Barren Grounds: Fred Schweder, Jr., setting out from the Windy River post toward the upper Kazan River, with three dogs and travois, to prepare his trap-line for the winter. September 17, 1947.

Fig. 2.—Eskimos, laden with camp gear and trade goods, marching over the Barrens from the Windy River post on the way to their camp on the upper Kazan River. They represent the human element that has the most direct effect upon the mammalian fauna of inland Keewatin. Front to rear: Hikwa, Angwokook, Alakahaw, Amelook, Katello. October 6, 1947.

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